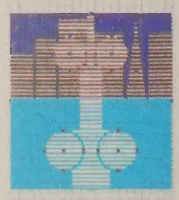
Articles by Tim Alderman

Image	Title	Subject	Industry	# of Pages	Year Published
WUTCO	Western Union is in Trouble	A 143 year old company, used to being a monopoly, cannot adapt to a new era unregulated industry	Telecommunications	4	1986 CSD
	(no copies available here)				
	Cruising the Moscow Arc	How a US satellite engineer managed to bring the first legal reception of CNN and MTV into what was then the Soviet Union	Satellite	16	1991 unpublished
	(Special page of SMATV Headend layout for Coops eyeballs only)				
ADL ANTENNA DOWN LINK, INC.	Conversation with a feed Guru	Chasing down an industry pioneer and feed manufacturer proves to be an interesting story	Satellite	4	1995 unpublished
	Microwave Visions	Terrestrial microwave radio history in the SF Bay Area, with a proposal to build a new company	Telecommunications	14	2002 unpublished
	(Special pages inserted for Coop's eyeballs only)				
	Backyard Feed Tests	Upset over mis-representation of feed performance, I decided to conduct my own tests	Satellite	4	2003 SatFACTS
	Digital Private Cable	How I combined the latest technology and years of experience to provide free to air signals in heart of "cable country"	Broadcast	7	2004 SatFACTS
	(Special page Digital Broadcast by frequency in Northern California)				
	TO MUCH SIGNAL	The story of how I solved a very difficult digital reception problem at one of San Francisco's wealthiest residences	Broadcast	9	2005 SatFACTS
	Why I won't give up my C band dish	A 9 month odyssey started when they took away my analog feed of the History Bistory Channel	Satellite	10	2005 SatFACTS

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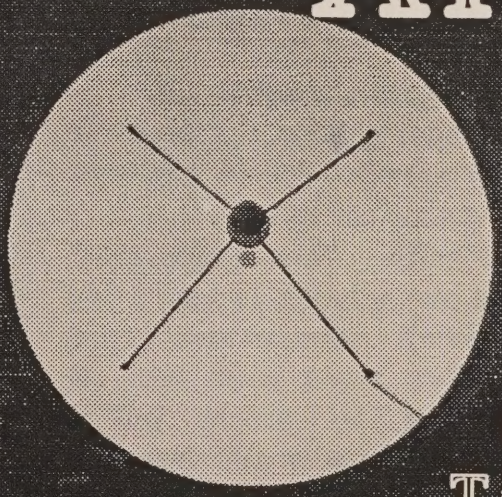
US TVRO installer provides CNN & MTV
to the Communist Party Central Committee's hotel

Cruising the Moscow Arc



by
Tim
Alderman

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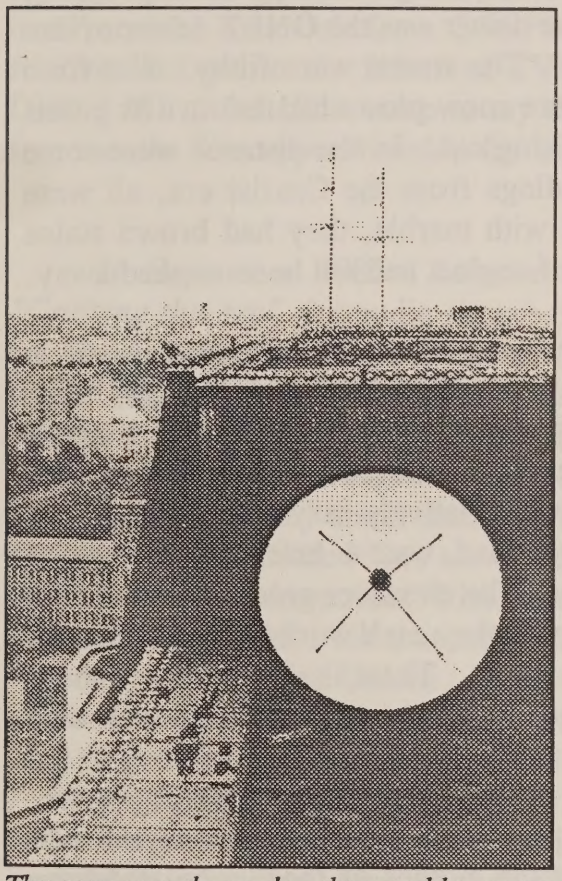
Cruising the Moscow Arc

U.S. TVRO installer provides CNN & MTV to the Communist party central committee's hotel

by Tim Alderman

A Welcoming Experience

The plane shuttered as we descended; at last it penetrated the clouds after an eternity of suspension in the dark sky. When the thick cover finally parted, I saw my first view of the Soviet Union. A barren landscape covered with a thick frost of snow and ice lay dimly below. A single huge building, stood alone against the elements. As the plane landed, I could see the airport building, much smaller than expected for a city of eight and one half million people. It was almost totally devoid of decoration. As the weary travelers approached the end of the tunnel walkway leading into the terminal, we received our first dose of Soviet hospitality, a locked door! It was an omen of many things to come in this closed society.



The coup was doomed... they could not stop the free flow of information from the roof of their own hotel!

My sponsor's party was given VIP treatment in a waiting room that had only one small window. So this was the Soviet Union, bastion of the society that tried to "bury capitalism?" After what seemed like a second eternity, we heard that all papers were in order. However, we spent the next three hours trying to get our sixteen pieces of baggage through Customs! We went upstairs, downstairs, back and forth, first getting this paper and then that. Under my arm was my

Avcom PSA65 spectrum analyzer[1], which I refused to relinquish, as it had earned me a living since being laid off by MCI. Finally I left it in a chauffeured car sitting outside. We finally retrieved two suitcases and had to leave the rest behind. Ultimately it took a week, and several trips to the airport, to rescue those other cartons. That doesn't begin to say what happened to the satellite dishes I had ordered.

The drive from the airport to the city felt like the Indianapolis 500. Our driver dodged slow trucks and semi-broken down midget cars on the expressway at speeds approaching 90 miles per hour. The driver was the ONLY driver of that car, which he kept in immaculate condition. The streets were filthy. Not from litter, but MUD; piled high on the sides where snow plows had left it. At points in those piles, we could see auto bodies sticking out. In the distance were some dreary buildings. Except for some old buildings from the Czarist era, all were devoid of architectural amenities. Covered with marble, they had brown stains near the bottom, where the mud from years of neglect had not been washed away.

Crossing over a barricade to keep out cars, our driver dropped us off in front of the building where my sponsors had their office. Like all buildings, it had a set of double doors, and all the windows were double-pane. Inside a single guard stood beside a tattered desk with a book that needed to be filled in with descriptions of all who entered. Getting IN was relatively easy with our luggage. Going back OUT was only easy if all you had was a briefcase or special paperwork, or the guards were slack that day. The elevators groaned like ancient mechanical monsters. Although there were two, they each worked independently; one went to EVEN floors, the other to ODD floors. There is no gentleness about elevators, they close swiftly and it's dangerous to try to keep the doors open with a finger. The bare wires above the elevator portal stood in mute testimony to the fact that at one time there was a call lamp, obviously not a necessity any more. On the wall a missing plate of marble exposed the stucco and concrete sub-structure with bare wires protruding to snag the clothes of those who stood too close.

Signal Obsession Leads to Employment

Barely three weeks before, I was hired to do a special job. They needed

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[1] SPECTRUM ANALYZER -- An expensive piece of test equipment used to see what is going on with the electrons. Most TVRO dealers cannot justify the $2,000 - $5,000 to own one.

someone who knew telecommunications from a broad perspective and specializing in TVRO installations. In 1984, while working for Western Union Telegraph Co., somebody handed me an article about home satellite dishes. I had been working satellite data circuits for many years, diagnosing problems when my company launched the first domestic satellite, Westar I. Intrigued, I spent the next six months obtaining every possible scrap of information.

While I started out merely trying to become a consumer and dish owner, it rapidly became apparent that my interest and background dictated a much larger involvement. An article from *COOP's SATELLITE DIGEST* about the Washburn receiver led me to the father of TVRO himself, *Bob Cooper*. A dealer from Distant Mirror satellite came to my door for a site survey; I wound up working five months free apprenticeship for him instead!

In September 1985 I became engaged in a new favorite activity called *"Cruising the Arc"* for audio signals. One night I ran across a little subcarrier off the beaten path of Telstar 303 called *FM AMERICA*. Bingo! This was like short wave, which I loved dearly as a child, and pirate radio, which I built as a teenager. The man was talking LIVE ON THE AIR to callers who were also dish owners. It was a signal I could not ignore. Keith Lamonica, the host, had real charisma, talked about dishes & scrambling, that ugly word about denying access to our cherished free airwaves. Ever since a short wave told me about other lands and viewpoints, I had recognized that radio waves didn't recognize borders. As a child, I felt that radio waves would eventually conquer our principle adversary, the Soviet Union. Little did I dream that I would one day aid the Soviet Union in receiving free flow of information.

In March 1986, Chuck Dawson, another articulate man with strong entrepreneurial urges emerged. As the evening talk shows progressed, Chuck became an increasingly familiar voice on the *FM AMERICA* talk show. In June of 1986, Chuck launched his own talk show. In July I called Chuck & offered to examine his technical problems. Eagerly he accepted my offer & the resulting relationship laid a foundation for changing my life.

The technical challenges were in getting callers from all across the country to sound good, even though some called from rudimentary telephone exchanges with very weak volume. I learned more about democracy in the three years that

K-SAT was on the air than I ever did in school. I refrained from being political myself, keeping to my technical chores instead. A "perk" turned out to be that I got to have my own talk show with two hours weekly. My topics covered both audio & video.

I continued to work for Distant Mirror doing dish installs, but turned down more work than I accepted because I was doing volunteer work for the "good of the dish owner." K-SAT folded in April 1989 when Chuck Dawson finally tired of begging for money.

In January 1990, I discovered that this background could be put to good use. Having read industry trade publications for years also helped me educate a gentleman who needed help installing a SMATV[2] system in Moscow. He became my sponsor & sent me overseas. It looked like cruising the arc was going to pay some handsome dividends shortly.

Signal Starvation

Soviet television sets have only six preset push buttons. All five local TV stations need translation from one VHF channel to another. The big expanse of empty space between buildings, coupled with their unbroken facades produced reflected waves of unbelievable power. Naturally these contributed to "ghost" reception that made on-channel distribution impossible. The TV antennas on the roof would have sent *Bob Cooper* into a tizzy if he had seen then while publishing his *DIGEST* magazine.

The Soviets wanted CNN, that bastion of U.S. cable's viewpoint, on the last preset button. Ironically, it was my job to install it, and later on add other impulse pay movie services as well.

In preparing for my journey, I assembled, on short notice, equipment for providing CNN. I insisted that we take two of everything, including dishes. I determined that the signals were approximately equal to G-STAR signals available on the West coast of the U.S., and so ordered two 10 foot commercial solid panel dishes.

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[2]SMATV -- Jargon for Satellite Master Antenna TeleVision, used in multiple unit dwellings such as apartments and hotels. Competes with cable TV.

Institutionalized Everything

On the hallway leading to the third floor office of my sponsor, the carpet displayed rectangular bulges where hatch doors were in the floor. Used to cover cable conduit pull boxes, they showed evidence that everything fit, except that it didn't fit well. The door to the office had, in addition to a lock and handle, a set of knobs with a hole through them. One was on the door itself, and the other on the adjacent door jamb. A wax seal held together a wire thread through both. Each person had their own copy of a symbol that was embedded in the wax, and the user sealed the door against tampering. The zealous efforts of maintaining, with pride, this seal system, spoke of the mentality of where mistrust of one's fellow man was evident. In a society where there were shortages of everything, the locks, seals, guards and security documented ways to prevent pilfering.

These factors led me to wonder how the people ever manage to rise above a state of depression, given the dreary existence of life in buildings that never had their walls washed. Yet, survive these folks do. Their spirits are alive; smiles were evident on faces seen on the streets. Each employer seemed to care for his employees beyond what is considered normal in the West. I never saw a "brown bag lunch" during my stay there.

The Communist Party Central Committee's hotel was full with a Party function & was unavailable for our first night's stay. Therefore our party spent the night in an apartment on the south end of town. It was a luxurious unit, with two tiny bedrooms, bathroom, hallway, kitchen & "living room" that doubled as a third bedroom. The heat was involuntary, no way to turn it up or down. A pipe came up through the floor, went through a steam heater, then continued up to the apartment above. No one attempted to conceal this plumbing, which was powered by a coal fired steam plant a mile or so away. Moscow has central planning carried to an extreme.

The following morning the sun rose to reveal a scene outside on the tiny balcony. It showed that the building we were in was just another giant building separated by huge space from the next one. In between snaked a pot-holed roadway with a bare-essentials bus shelter. The workers stood in line dutifully waiting for busses, which seemed to be everywhere at an early hour. It seemed to me that their public transportation infrastructure was in good shape. The apartment I had stayed in was in a building with perhaps 2,000 other units, and it

Figure 2 ..& they stretched across the horizon in never-ending groups.

was small compared to others. I guessed that the ones on the horizon contained upwards of 20,000 units each, and they stretched across the horizon in never-ending groups.

The Communists had done well

We arrived at our hotel to find a massive brick structure with a 700 unit apartment complex for the Communist Party cadre next door. Unlike the rest of the city, the buildings showed years of exquisite maintenance. The marble floors, the carpets on the stairs were in fine shape. It was small wonder why, for this hotel had 700 employees for 220 tidy wood paneled rooms. Each had a spacious bathroom with tub, bidet & shower. The beds were tiny, and covered with a two-part sheet that separated in the middle. Inside was a thick heavy blanket that made me feel like I was sleeping under a leaded sheet. Each day we the maid left two bottles of carbonated water on the small table. Amenities included laundry & ironing services, as well as a "free" breakfast. One would be wise to bring toilet paper from the U.S., as Soviet toilet paper resembles wax paper.

Figure 3 With brand-new US made TV antennas shining brightly, the hotel and apartment complex next door lead the way in providing SMATV service.

People take time off frequently, mostly to stand in lines. On holiday eves it is also customary, like on our Christmas Eve, to depart work around noon. With 22 holidays a year, such days ease boredom. Our crusade to rescue our baggage from the airport customs ran right into the middle of Women's day, and so we lost three days in even getting started. I did have the good fortune of meeting BORIS, who was the manager of the hotel's telecommunications and TV departments, on that day. Boris would later turn out be a very close ally in helping knock down barriers to bringing in our promised "gold" of CNN & MTV.

Cruising the Frozen Arc

On Monday, March 11, my work began in earnest. At my sponsor's office building, I was able to do some preliminary arcing. On the top of these buildings there was no protection against freezing temperatures once the winds started. With triple the amount of clothing normally worn, I was at least able to find a satellite signal, in ARABIC! I had no idea that such signals were this far north, but what I saw on C-band[3] was evidently some Arabic backhaul from New York to the Saudi Arabian peninsula. It was comforting to be able to be somewhat productive.

In the mornings, the first hour after breakfast I waited for someone to show up in the hotel lobby. My translator & journeyman technician, named Mark, would dart here & there, trying to find Boris, who had control of access to the roof. We then waited an additional 45 minutes for keys, so that we could begin.

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[3]C-band -- A band of microwave frequencies used for the majority of satellite signals in the U.S. but uncommon in Europe, where the smaller Ku-band is used.

First order of business for any TVRO[4] installer is to assemble a mount and there was no exception here. Mark had arranged for a stand and four legs to be welded and transported to the hotel, before my arrival. Crude in appearance, they had bits of welding debris covering every inch of surface. Engineered well and appearing to be sturdy, they had black paint hurriedly applied. Officially they would have taken six meetings and six months to build, but these took only a day by other means.

It was next that Boris came up with his first stroke of genius, why not use left over elevator ballast for weight? Since this was to be a non-penetrating roof mount, that seemed like the way to go. How would we secure them to the legs? A few hours spent in the hotel's MACHINE SHOP finally provided the answer. Six workmen and Mark together came up with rod that was cut and threaded, along with tie-down plates at either end of the rod to act as support. By now it was Thursday, a week on site and no Hotel CNN pictures. Next we overcame the problem of having the legs stand off the roof, to avoid attracting moisture and rust. The hotel's carpentry shop swung into action and came up with several pieces of 2 x 12's coated with the Russian version of water seal. The carpenters grumbled about not being allowed to let the wood cure for a few days but were told not to worry about having their "green" work put into service right away. When we needed a saw to cut a piece that was too long, two carpenters took 10 minutes, using a double person hand saw, to cut the pieces. Back home an electric saw would finish this job in seconds. In Russia, I learned, there wasn't a shortage of personnel, and each has his own specialty.

Figure 4 Boris & Mark

Next came the electrician. I had requested power on the roof dish site, and after a 45 minute wait, the hotel's electrician showed up and wired into a power box in the boiler room next to the roof area. This took him 20 minutes or so.

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[4]TVRO -- TeleVision Receive Only--the name used to differentiate us from those who Uplink.

The next day, we repeated this process. He had evidently removed the power cord the evening before. This procedure of waiting 45 minutes continued for the start of a third day when I convinced Mark of the waste of time it was causing. I guess that he removed the cord because he was afraid of somebody stealing it, even though it was behind locked doors.

"Psst, Want Some Terrestrial Interference?"

In freezing weather on a cloudy afternoon, with light snowflakes drifting down, I turned on my spectrum analyzer to find nine BIG carriers present. "OH BOY, finding pictures," I thought, "in this area is even easier than back home." As if a little kid I immediately tuned in the Drake receiver we had brought in our "baggage," rescued only two days before from the iron grip of the airport customs, only to find RUSSIAN TV. That enemy of all TVRO installers, *TERRESTRIAL INTERFERENCE*[5] was present, on Ku band no less! With all those carriers it was like trying to "find a needle in a haystack" for something in the sky. The interference seemed to be coming from everywhere. The wind, snow and numbness of my fingers started to take its toll, and I headed inside to warmth & rest. The following morning, having a clearer mind and renewed dedication, I found the arc. The hotel was in a microwave path, from the TV studio in the southern part of town, towards the OSTRANKO[6] tower. The T.I. were video carriers 5 divisions high on the analyzer. A bit more signal and we could have roasted a turkey, except that the outside temperature was still below freezing.

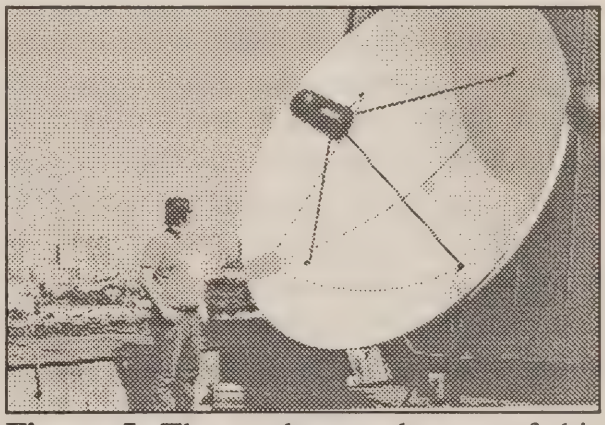

Figure 5 The author and one of his reflectors bring free flow of information..

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[5]TERRESTRIAL INTERFERENCE -- Signals from ground sources in the same band of frequencies used by TVRO's. These signals can be 100,000 times stronger. Talent, education, proper test equipment & even sometimes just plain luck are used to prevent "TI" from destroying wanted revenue signals from 23,400 miles out in space.

[6]OSTRANKO -- Once the world's tallest structure, this TV tower send out very powerful signals.

I then placed the dish behind a copper facade that echoed a cacophony of reflected signals, causing the T.I. to come and go, much like satellite signals, when moving the dish. This was due to knife edge diffraction around the sharp edges of the dish cutting across various scattered wave fronts. Armed with correct compass readings and strict adherence to installation procedures, CNN finally appeared. An ADL feedhorn[7] replaced a Chaparral model & additional signal strength brought the picture out of the sparklies. The only telltale sign of a satellite signal was DITHERING[8], which was a welcome sight, as T.I. doesn't dither.

On the 14th floor the hotel had a special conference room. Next to it, in the foyer, behind beautiful wood panels, was a door to a hidden room only 38" wide, and 20' deep. On the far wall of this headend room I discovered the hotel's Hetrodyne processor shelf, meticulously installed and regularly maintained. Not only did this system feed the hotel, but the Communist Party's apartment building next door. This tiny room fed TV channels to some 900 sets, each with six preset buttons.

The Ukraine, another hotel in town, had been using signals from Eutelsat and so we settled on that satellite, which was just barely above threshold on the vertical side, and just below on the horizontal. This produced a signal strong enough to bring in *Superchannel*. It seemed that everything "western" in culture was in big demand. Unable to find *MTV*, we settled on this hodgepodge channel and stuck it on a borrowed consumer modulator[9]. Reflector[10] performance was disappointing, but I justified this by thinking that the signals were weak. I had the second of the two, which waited for ten days to clear customs, stored face down on the roof. Unknowing Russian hands warped it during assembly.

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[7]FEEDHORN -- The actual antenna of the satellite system, works much like a flashlight only in reverse, for picking up those very weak signals from space.

[8]DITHERING -- Fluctuations used to spread energy out on satellite signals. Looks like strange to see it for the first time, a signal "wandering" about on the analyzer.

[9]MODULATOR -- Low powered television transmitters that generate the channels the TV's in hotels (or on cable, for that matter) actually tune to.

[10]REFLECTOR -- A more proper name for "dish", it is that large part that reflects signals into the feedhorn.

We left on the 19th of March, and the airport Customs was meek compared to our arrival. The frozen ground was not quite so foreboding as the plane winged its way. Never in my life had I the opportunity to go so far from home to deliver so few signals to such an appreciative audience.

Boris the Gracious Host

The highlight of my second trip, however, had nothing to do with the dishes themselves. Mark and I were invited to Boris's apartment for dinner on a Saturday night. Boris had been, as I understand it, the chief protocol officer in the hotel. This meant giving weekly pep-talks to employees and maintaining bulletin boards posted everywhere in workshop areas, which extolled the virtues of Communism. The ride upstairs was in one of the narrowest elevators I had ever been in. Boris, his wife, mother & daughter welcomed us into a small, cozy apartment. They had already set the dinner table, & friends were already there, partaking of hour devours. The TV set showed CNN with distortion from the local station attempting to override the modulator fed signal. I was enjoying a light dinner, when a toast was made. Translated, it was to the success of our adventure in bringing U.S. cable programming to the U.S.S.R. Afterwards, they served a whole feast, which tasted as good as anything I'd ever had, home cooked. There may be differences between the "western" and "eastern" palates, but I couldn't tell it at that point.

The conversation, through an interpreter, was of my opinions on their country. I said I was a guest, when asked about Gorby, and said I thought he must have done something right, for he had received a Nobel prize a year earlier. Fortunately, that was the only overt political question I faced during my four trips. The conversation then turned into four and twenty questions about the U.S., and comparisons of daily life. The tone was of very friendly curiosity, not at all the bitterness I thought that they would feel, after all those years of indoctrination. Boris, the chief of Communist ideology, living in a Communist party apartment building next door to a Central Committee hotel, was extending kindness to a capitalist worker far beyond the bounds of mere duty. At the end of the evening, he presented me with a hand painted picture, in oil, as well as a bottle of Cognac. Thus, the thoughts I had were not of politics, but rather of people. Boris was something of a capitalist himself. He began taping that Superchannel TVRO signal we left on the air.

Evidently I had impressed them enough to be invited to go with them, sans interpreter, to visit the famous "Moscow McDonald's." The very next day I went off with my hosts to visit a 16th century cathedral, complete with gold domes, that stood next to the Communist apartment building. I found it odd that such splendor, now displayed as a museum, had survived 70 years of neglect, and had, recently been reopened. Heavily guarded by old women who watched tourists' every move, it had old world charm. Heading out, we next ventured underground into the maze called the Moscow Metro. Even though it was damp and dusty, there was not a spot of graffiti to be seen, and beggars were rare. Evidently they roll the sidewalks up EARLY in this town.

Two hours and six stations later we ascended to the park where we found the "Pectopah," or restaurant. I had heard that there was a three hour line to get in, however our wait was only about two hours long. This is definitely the world's largest McDonald's, the counter inside is at least 100 feet long. As a place to sit was hard to find, only Boris' wife got to sit down. They had simple hamburgers, while I had a Big Mac, which I found better tasting than those served on this side of the planet. I suppose it's the lack of preservatives, and fresh lettuce (obviously imported, there wasn't a green leaf to be seen in March in Moscow). I grabbed a second one for take out as we headed out the door, past the ever-present security guard. Would there ever be a place where there was more trust and less security?

Signal Success in May

I couldn't believe the ragged signal that I was seeing could possibly be salable, but evidently the Russians had a real depth of western signal starvation going on, and Boris was able to capitalize on this fact, horrid signal quality or not. To my *K-SAT copyright* indoctrinated mind this was a travesty of unspeakable dimensions, but being a guest, and a "supertech," I decided my thoughts best be kept to myself on this one.

My plan of attack, this second time around, was to pull out all the stops, and really get comfortable with some serious arc cruising, with my sponsor's blessing, of course. Three days after arrival, on a beautiful sunny Saturday morning, I got my chance. It turned out to be the turning point of the trip, technically speaking. First I removed the warped reflector's eight stamped steel panels and outer ring, leaving only the ribs attached to the center hub. Next, I had a Russian borrow

some thread from a seamstress deep within the bowels of that building. With the remainder positioned like a birdbath, I laid the thread across the tips of the ribs, four opposite pairs. This spare reflector had evidently relaxed somewhat to where two of the string pairs were barely touching, while one was 1/4" low and the last was 3/8" high.

Laying a straight piece of rusty old pipe across the ribs adjacent to the lowest string, we determined which rib was lowest. We added a flat washer between the rib & hub assemblies. My audiophile knowledge about turntable geometry played a big part in choosing the right thickness washer to align that string to the pole to where it just barely touched. We proceeded on to align three additional ribs in a similar manner, and checked to see that all four strings just barely touched. My partner Mark, always wanting to understand my choice of this point as "true," couldn't understand that I was using my innate trust in dead reckoning in such a delicate matter. I knew what I was doing was attacking that hidden enemy of every inexperienced TVRO dish installer, *NOISE*. Like water seeking it's own level, a dish reaches a very quiet spot when all of its major-area curves line up.

With the help of some of Boris's helpers, we managed to swap out the old dish for this new *enhanced version.* As soon as I put the Avcom PSA65 on the dish, I noticed a difference, the T.I. had a bit less energy. I could see that something else was different here. The noise floor was a whopping 5dB lower! Now, maybe, we could find a few signalized fish in this pond.

You can't cruise the arc in Moscow the way installers do in the U.S. With Boris, a helper, & Mark all watching, I cruised slow & steady. A one eighth turn of the elevation rod made an adjustment, and just barely nudge the bottom of the reflector. Stop, look at the pattern of signals memorized as T.I., move on again. T.I. is a very cagey enemy. Because of knife edge diffraction, it spreads out like a rainbow of signals from a prism. Thus a signal chaser might think he has something, only to discover just another image of Moscow TV relay service. The only way is to cruise and ignore 90% of the signals. About 20 minutes later something different, a data signal, came up. I zeroed in on it and then popped on the receiver and TV set. YIPES, there was a sparkle free golf game, open mike.

I knew it must be a backhaul[11] because of the lack of an announcer, and the excessive amount of time the players took meant it had to be real time. "LORD, I said to myself, now this is *arc cruising*!" It turned out that this was RAI UNO from Italy. We had ourselves a NEW BIRD, previously thought missing this far east, Eutelsat F2.

The very next day I decided to get down to the nitty gritty, now that I had something decent to cruise with. My Avcom showed only 1dB additional strength. With so much less noise to deal with, things really started to make sense on this opposite end of the planet. My reward was not long in coming. Cruising east of Eutelsat, I spied some dithering not more than a quarter turn up on the elevation rod. Zeroing in, I found the nirvana of all signals, the one REAL THING that Moscow craved, especially those under age 30. MTV sparkle free, there it was, a dream come true. Just wait until I tell my sponsor!

My visit in March had jaded me into thinking that this arc was indeed barren, that's simply untrue. Compared to U.S. arc, there isn't much, but for a signal starved superpower, there are some 40 signals to choose from, plus much more in the way of audio.

Coup De Etat!

The arc having been conquered and T.I. somewhat abated, the next step was getting the signals processed and downstairs. By July we had erected three reflectors and fed signals to the headend[12] room on the 14th floor. They had subsequently widened a small portion to allow us to move in two back-to-back equipment racks. From this we were able to choose nine satellite signals from five LNB[13]'s, which allowed us to choose a wide variety of programming in several

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[11]BACKHAUL -- Signals from field reporters going back to the main studio, network control or news room. Highly prized by dish fanatics as being a real source of unedited news. Can be immensely boring followed by seconds of excitement. Legends have been built around the unauthorized reception of backhauls.

[12]HEADEND -- The first point in the SMATV system, where signals are processed from off air and squeezed into a pipe they call a "cable".

[13]LNB -- Low Noise Block downconverter. Out at the dish, this piece of equipment, and it's steady price decreases over the years caused economic justification to turn TVRO from a curiosity into a real cable competitive threat.

languages, in addition to CNN & MTV.

August 19 shattered the world's headlines with a Coup-de-etat in Moscow and Gorby was arrested at his summer Crimean home. The plotters were all top Communist Party officials, and since they lacked the iron fist of control, they plotted their moves NOT in the Kremlin, but in a nearby hotel. Not just ANY hotel, mind you, but "our" hotel. By this time Mark had erected a stand containing twelve 21" color TV sets in the hotel's three story marble-lined lobby. This impressive sight was gathering small crowds to view the events going on, LIVE, by way of satellite on several channels. It so happened that CNN was blocking the Russian speech when showing Moscow events and translating into English. Mark soon discovered that Galavision was also providing translation, in Spanish, but AFTER the Russian speaker had finished his commentary. This allowed something unheard of in that society--*FREE FLOW OF INFORMATION* that was blocked off air locally by the plotters. Needless to say, the crowds grew as word spread that uncensored coverage of events unfolding locally was available in the Communist Party Central Committee's own hotel lobby!

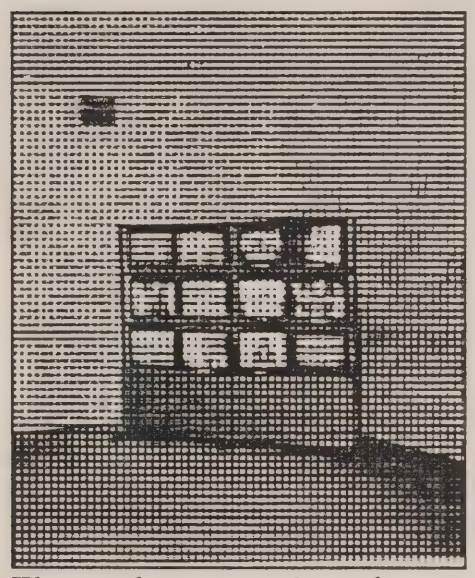


Figure 6 Erected just 6 days before the coup, these sets demonstraited hotel managements' insistance in keeping the truth on display.

Vladimir Kurchikov, one of the 'Gang of 8,' and head of the KGB, noticed this crowd on the second day of the coup, and ordered the hotel management to SHUT IT ALL DOWN. Perhaps it is a sign of the times that the hotel's management REFUSED his order, wanting it in writing first. They arrested him the next day when the coup collapsed. One never knows, but that stand of TV sets, fed by a design I helped construct, may have MADE A DIFFERENCE in the events that occurred.

As individuals, most of us never seem to participate in events that change the course of human events, we only observe. CNN interviewed my sponsor on that first eventful day at our San Mateo office. They ended the broadcast by

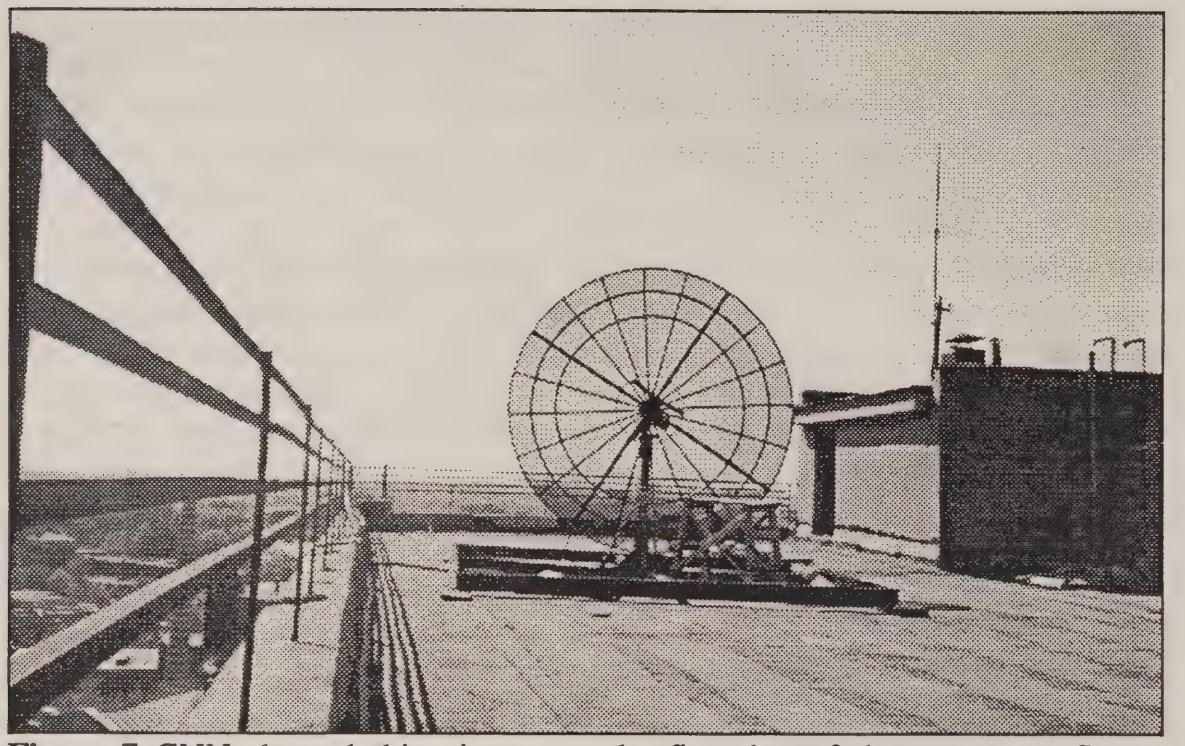


Figure 7 CNN showed this picture on the first day of the coup, a reflector picking up CNN!

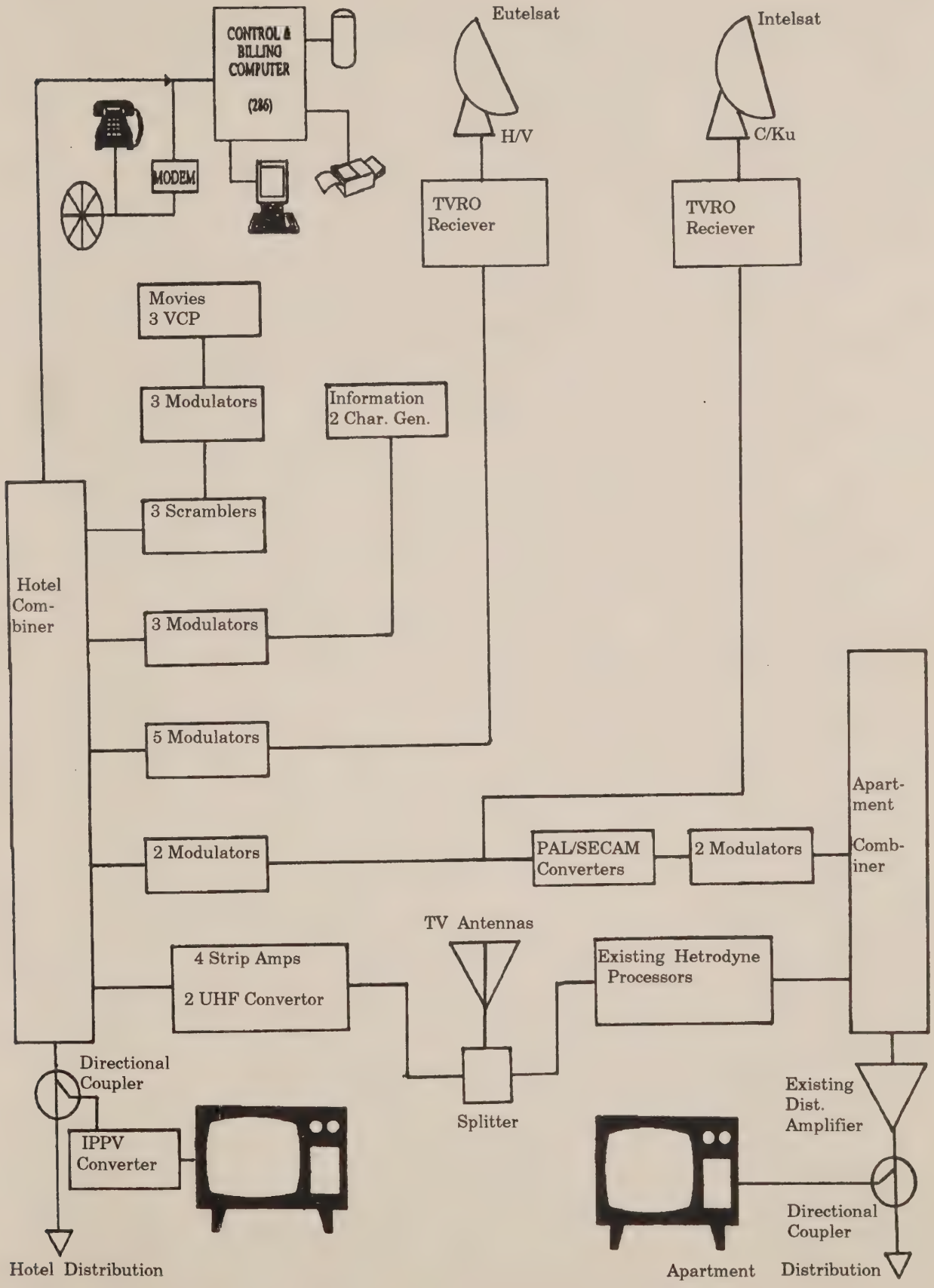
showing a picture of a dish I had erected in Moscow, which was picking up CNN!

I can only hope to be fortunate enough to continue to spread the free flow of information where ever it needs to be spread, and to teach those willing to learn the fine art and science of cruising the arc.

Tim Alderman

Cruise14.WP5

Oktyabrskaya Hotel SMATV



Conversation with a feed Guru

a brief interview with Gerry Blachley

By Tim Alderman

Preamble

There were many questions unanswered in my mind about feeds used for satellite systems. Since my early involvement with the TVRO industry, now some eleven years ago, I was aware that ADL feeds "looked different" than the others. They were larger and heavier, for one thing. Another was they lacked a series of concentric rings, called "scaler rings" used on other brands.

My early investigations also showed a performance difference. ADL feeds had a margin of improved performance over others. Then, of course, there was the "TI" issue. Terrestrial interference was suppressed better by ADL feeds and I doubt if there is anyone willing to argue that. I also found that ADL had better cross pole isolation, which is important in all installations, and critical in commercial ones.

Thus my backyard had always seen ADL feeds. Of course, I had TI that was 20 times worse than any customer installation. In Moscow, on the roof of the communist party central committee's hotel, back in 1991, it was an ADL feed that captured MTV from Astra, a satellite deemed by others to be to weak for reception that far east of maps showing the satellite's footprint.

The RP-1 is his flagship product. It uses "hybrid moding" to capture part of both of the components present in an RF field, the "electrostatic" as well as the "electromagnetic" fields. Scaler feeds ignore one completely because they cannot cope with the 90 degrees of phase shift between them. "Hybrid Moded" feeds also exhibit better control of VSWR and the impedance changes that a feed must produce to properly couple signals from the reflector to the LNB.

Equally interesting was the man behind ADL. Always with strong opinions, Gerry Blachley had held ADL together despite the 1986 disaster which drove 80% of the business in TVRO under. He was steadfast in refusing to compromise his design at first, but gradually came to realize his problems were with marketing and not excellence or quality. For one thing, the man INSISTED that all reflectors be "shallow", meaning f to d ratios be .375 or greater. His RP-1 capitalized on this by having a superior "illumination taper" than the others. His designs came from a man who also designed the feed systems for the Pioneer series of deep space craft launched by NASA. He also designed and marketed a Circular Polarized feed, called the RP-1 CP-400.

But the market would NOT listen. The manufacturers kept sending out .3 to .35 reflectors. His feeds took a performance "hit" because they didn't "illuminate" the entire surface. And he lost sales to the "scaler" feeds which had such things as "adjustable f to d" and "gold rings" which changed illumination taper at a cost of VSWR.

Always the inventor, Gerry solved this problem by introducing his RP-2 feed around 1990. This lacked the precise illumination taper of the RP-1 but kept the essential "moding" characteristics. For "deep dish" reflectors it solved the problems of performance penalties from scaler feeds with gold rings.

Around 1993 Gerry shocked his loyal fans with two events: He "licensed" Cal-Amp to produce his feeds under their name, and he introduced the RP-3, which is a true ADL feed on the rear half, but with the front end "scaler" instead of hybrid moded design.

Gerry also found another, even more insidious problem... His design, although patented, was copied by a much larger company, Chaparral Communications. Gerry found himself spending more and more time in the lawyer's office than in his workshop and laboratory. By this year he has spent $1.6 million in court costs and attorney fees trying to get Chaparral to pay him damages. Even with several court judgments against "brand C" he has yet to collect any money.

Burning Questions

Gerry has always regarded me kindly. From the very beginning he has given me product as well as sold me stuff at prices well below wholesale. I am not sure exactly why I have deserved such treatment, but it has made me loyal in my support of him and his efforts. I also have made a point to be on good speaking terms with his wife Virginia, who also works in the business. In 1990 I visited them on "easy street" where they rented a warehouse full of machine tools. Stepping gingerly past piles of lathe shavings, he took me into his inter sanctum and showed me a test of two motors. One was "brand C" and one was one of his. This guy had found a motor at least 4 times as powerful, yet only in a slightly larger case. I found that my fingers COULD NOT STOP the armature from turning, they hurt from the effort! The "brand C" was a joke by comparison. He also "isolated" his motor from the feed assembly with a thick nylon spacer, preventing moisture ingress which can occur during freezing weather.

New Zealand was where I visited recently, having helped assemble 4 .31 f to d deep reflectors for Doubtless Bay Cable and the Barrycourt hotel. While at the Barrycourt, I noticed a black feed being used as a doorstop. Inspecting this feed, it looked like a cheap "knock-off" or copy of Gerry's CP-300. Knowing the Gerry was always vigilant about protecting his designs by patent, I thought I'd do him a favor by getting this particular feed into his hands. There seemed to be a lot of these "pirate ADL" feeds floating around, though they lacked the sheer polish of the product they imitated.

Upon returning home, I called Gerry. He knew all about it, he said, for it came from a mold he'd seen in New Guinea years before. Nevertheless, at my gentle urging he agreed to accept the feed. I then wanted to order an RP2 as I knew my sponsor at Doubtless Bay Cable was using a "brand C" feed which was not giving all the signal he had paid so dearly for. To my surprise, Gerry agreed to "trade" feeds! This was an offer I could not refuse, a "doorstop" for at least a dB of additional signal.

Needless to say, my sponsor sent me a fax stating that I had indeed scored an additional dB, at least! SUCH PERFORMANCE COULD NOT BE IGNORED, especially in New Zealand. Having decided I could help the TVRO industry get a start there, I wanted to see if Gerry would consider a booth at the upcoming trade show in January, down in Auckland. His demeanor on the telephone suggested he could not afford to spend time away from his lawyers, however.

I decided it was high time to pay him another visit, so I gathered sponsorship for a 1,052 mile trip south to Simi Valley in southern California. I had questions that couldn't be answered any other way.

The Chase

I took a chance in meeting him at all. He'd been out of his office so often, bent on the legal pursuits, that when I tried to call he was out. Finally I reached Virginia. She agreed to meet me as I knew she could at least answer some things. So I gathered my wife, bundled her into the car, and we headed south at dawn, hoping to make ADL by mid-afternoon. Hopefully we might even be able to catch the man himself.

We arrived twenty minutes early. The front door was locked, so I poked my nose in the back and asked one of the lathe operators where Virginia was. He said she and Gerry were at lunch. Ah ha, maybe I might see the elusive feed guru after all!

After a brief tour of downtown Simi Valley we returned, this time the black pickup truck Virginia had mentioned was in front. NAT ADL it said on the license plate, so I knew SOMEBODY was there..

The Interview

Just as I walked up to the front door, Gerry was walking out. He of course recognized me, and stopped to chat. He stood as I went inside his small "lobby" which has 2 display cases loaded with copies of perhaps every feed he was ever manufactured. One feed in particular stood out: the black feed I had sent him. The "doorstop" had made it to his lobby!

TIM: I was hoping I could meet you today, do you have a few minutes to talk?
GERRY: Not really. I was going out to meet some real estate agents who want to sell me a warehouse. I'm tired of renting and want to own my own place for a change. I'm due there in ten minutes.
TIM: Well, did Virginia tell you I was coming? While I hoped to see you, I can perhaps get her to answer some of my questions. If you'll answer just a couple of things I'll get her to fill in the rest.
GERRY: Ohh, Okay, let me call them and tell them I'll be a couple of minutes late then.

TIM: I see the "pirate ADL" black feed made it here (pointing to display case). Did you ever get a chance to show it to your lawyers?
GERRY: Yes, and they are looking into it. But I'm not worried about that feed. Like I told you on the telephone, I know that design is the same I've seen before. I did have our crew test it, and it is no where close to our performance. The cross-pole isolation in that feed is almost nil. They will burn themselves out once people catch on.

TIM: You know I've been working on getting a new ADL distributor going down in New Zealand, don't you?
GERRY: Uh huh. Well I know that we just shipped out 30 RP1 CP400's to Papua New Guineas last week. The should keep them supplied for a while. I'm not sure what type of a market is down there, yet.
TIM: I'm not sure we are talking about the same folks, Gerry. If New Zealand TVRO takes off, I imagine my friend at Bay Satellite TV LTD will be ordering 30 feeds a week, if not more.
GERRY: I really don't care what sales are like these days, I haven't got time to be concerned with that. Al of my energy is going into this lawsuit (sigh). As long as sales are steady then I'm not worried. Besides, we are down to only four distributors here now. They seem to move our stuff without any problems.

TIM: My sponsor down there reports that your RP-2, the one we exchanged for that black feed, gives him at least a dB of performance gain. He also reports 5dB improvement in cross pole isolation.
GERRY: Well I'm not surprised, we've measured up to 12dB improvement here. Besides he has so many of our feeds down there already. We've been sending them to him for years.
TIM: Well I only saw one, Gerry..

TIM: I have been meaning to ask you this for a long time. If the RP-1 is such a superior design, why did you introduce the RP-3?
GERRY: We were forced to. So many folks want that damned scalar design, for some reason they think that having adjustibility of the feed for different f to d ratios answers all their problems. It's a crap design, it really is.
TIM: So why do you sell an inferior designed product then?
GERRY: They outsell the rest of our products twenty-five to one! You know there is more to a feed than meets the eye. We still have our probe design inside and that still gives it some oomph over others.

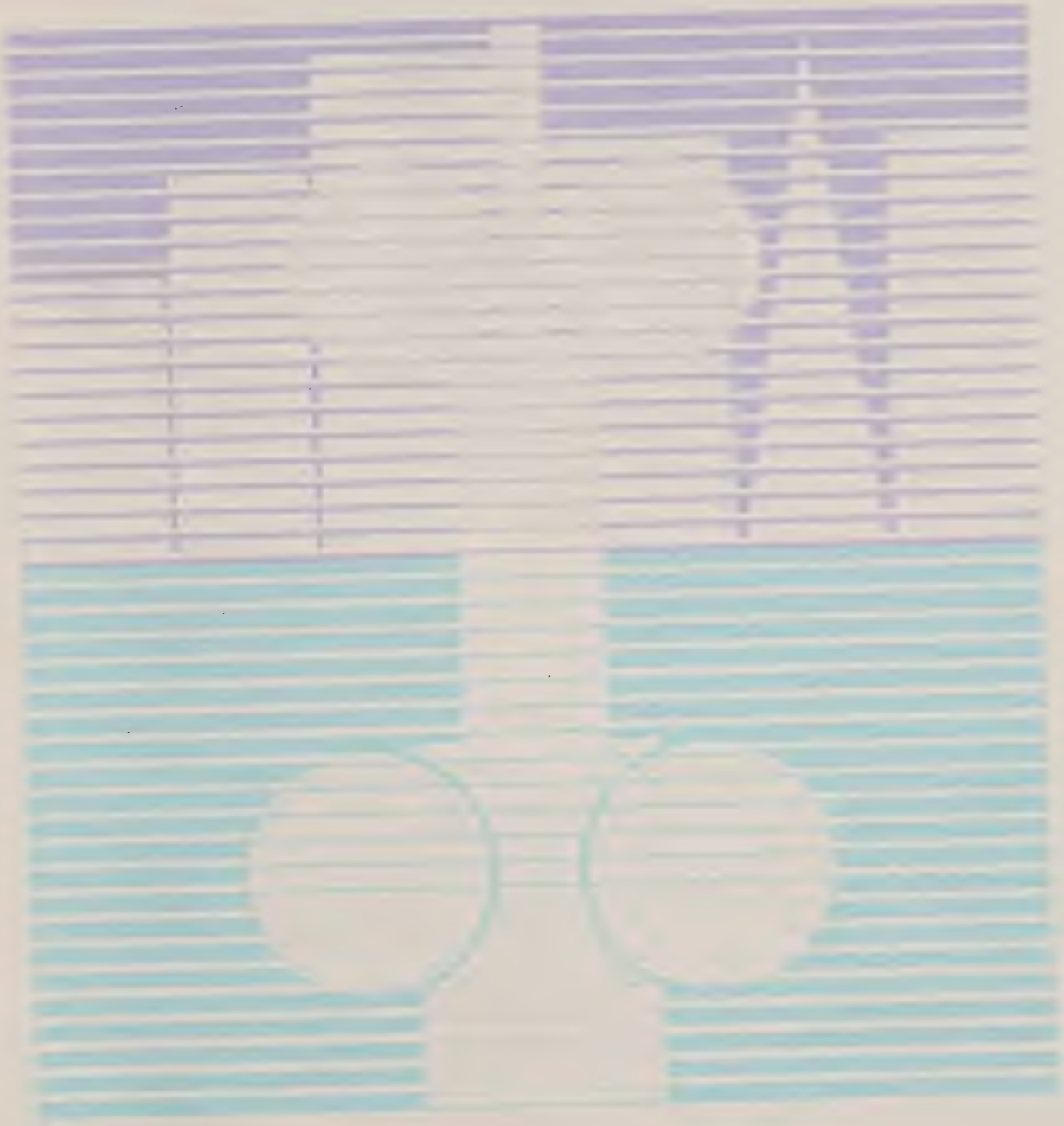
TIM: My last technical question. New Zealand TVRO has need for a combination feed that works C band both circular and linear. Would you consider it feasible to design a single feed to cover both, without a 3dB performance penalty?
GERRY: We already have! The RP-1 CP400 will work on linear satellites providing the interior plates are positioned PRECISELY. There will be no "skew" on linear but it will work.
TIM: Ohh REALLY! What are the losses, in comparison with the RP-1?
GERRY: You must make sure that the feed is really set up right for it to work, then the loss will be negligible, say, around .2dB.

TIM: Well Gerry, this is all very interesting. I don't want to keep you from your real estate deal. Will you still be located in Simi Valley?
GERRY: Ohh, of course, we're not going anywhere.
TIM: Thanks for taking time to talk with me this afternoon, Gerry. This puts a lot of questions I've had to rest, and makes my trip down here very worthwhile.

Postlude

After Gerry left, I saw Virginia, who was searching for the Trade Show literature for the January show. After failing to find it, I agreed to get her a new set of literature. Whether or not they actually show up in January is still open to question, but at least there is some interest. I did see a copy of SF#15 with me on the cover, so I know they are at least getting their subscriptions.

ADL®
ANTENNA DOWN LINK, INC.



Microwave Visions

Terrestrial microwave radio history in the San Francisco bay area,
with a proposal to build a new kind of telecommunications company.

By Tim Alderman

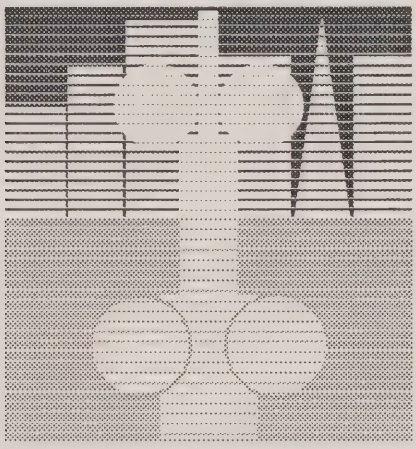


Table of Contents
Updated 8-6-2002

	Section	Topic	Pages
I.	Tempting Towers	Unique Historical Perspective	1-3
II.	Wireless Power	Why Microwave Today	3-6
III.	Capable Stewardship	Real Quality of Service	7-13

I.
Tempting Towers

In 1985 and 1986 Doric Telecom Properties made substantial investments into a relatively unknown arena of telecommunications. The US Congress created this situation, in 1984 when they passed the first substantial re-write of the basic law that governed telecommunications since 1934. Suddenly it was possible to create new companies, in a field formerly controlled by monopolies like AT&T, Western Union and ITT/WorldCom had invested before.

By taking advantage of the topography of the area, the founders of what became known as ***Bay Area Teleport*** **(BAT)** leased space, purchased roof rights and built from scratch a network based on digital microwave radio that became the envy of other carriers.

These investors knew what they were doing. They convinced Northern Telecom to not only sell them the brand new technology just then becoming popular, but to actually engineer the sites and build them to full commercial standards. Where there was a population center with very few high-rise

buildings, the investment committee decided to find the tallest of these, and pay top "penthouse" dollars to secure roof rights. They built tower stubs, ready to add on to in the future.

At a point close to the geographical center of the bay, BAT built the white tower that later became a corporate symbol. From this *Harbor Bay Isle,* a hub of microwave facilities was constructed that still serves the area to this day.

The other towers were either leased, such as at *Vollmer Peak,* where a landlord had already purchased hilltop land and built telecommunication facilities. But more commonly, BAT leased the land itself and built towers, such as *Mount Allison.*

Lastly there were the flat plane sites, where great heights had to be obtained to overcome Fresnel zone interference. Such sites as *Dozier* require FAA approved lighting to become licensed.

The effect of all this engineering was to create the finest, most direct and most extensive independent microwave telecommunications network ever built in the area.

The Wireless industry comes to Bay Area

By allowing companies to compete in the long distance field, the 1984 Telecommunications Act opened up sections of the finite and limited natural resource known as the public airwaves to local use. Many investment-engineering firms competed to find investors willing to take substantial risks with the lotteries, then later auctions, of frequencies allocated by the FCC. The rules were such that the firms had to do the engineering in advance for such opportunities that the FCC was offering. Cellular was the first new wireless telephone service since business band was introduced in the 1950's. Cellular investors became millionaires and generated lots of interest. The 1980's gold rush was on, as the FCC made possible the "bell bypass" technology MAS, then "interactive video" with IVDS. The 1990's saw the further mining of the limited resource of the public airwaves as UHF paging and PCS come to compete with the older technologies such as VHF two way paging and Cellular.

The effect of all this was to create a wireless industry trade convention show where various tower companies advertised directly to investors. Seeing a business opportunity, real estate investors in the various MSA's[1] built towers and poles to accommodate this fast paced growth. By 1995 the tower facilities in most areas had been fully loaded.

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[1] MSA = metropolitan statistical area - the basic method used to calculate radio markets and rank them according to size. There are also RSA's for rural areas, which are geographically larger than MSA's.

Bay Area Teleport, however, conserved space and rented out very few feet, and usually only to those companies with whom they did transmission business, or with whom they leased space at other locations. Thus the BAT tower system, taken as a 70-site group, was vastly under capacity. However, it still generated an estimated $1,000,000 month gross revenue in 1992.

BAT also developed a Network Operations Center that offered premiere services to their 25 customers. These services included advance notice of impending service interruptions, as well as monthly proof of performance statistics to every customer. Rebates for lost time that exceeded performance guarantees were automatically calculated and deducted from the bill as well.

Additionally, BAT generated a quarterly financial report that included reports on preventative maintenance statistics, showing how well the goals had been met by region by month. The budget committee approved significant capital outlays in advance.

BAT introduced the concept of actually managing customer business networking by monitoring call completion records and ordering moves, changes and adds from Pacific Bell as the calling patterns changed, for such customers as Expresstel and Telesphere. This concept of adding services on top of transport actually proved very profitable and worked well as a premium service company.

In December 1993, ICG Telecom Group of Colorado purchased BAT, principally to establish a presence in California without having to build from scratch. The principle asset they were seeking was BAT's fiber optic network. BAT had obtained very favorable conduit space rents from the ILEC[2] in return for tradeoffs. Additionally BAT had not only established a fine reputation with its customers, but had gained the respect of other major carriers as well.

ICG used BAT's switching facilities and fiber optic network to increase its presence, while neglecting and slowly dismantling its microwave network. Eventually, in 2001, this network was sold, having shrunk to a mere 23 sites.

Western Tele-Communications Inc. buys Sierra Microwave
Global Crossing Inc. buys Allnet Communications

BAT was not the only successful company who successfully deployed Northern Telecom RD6 and RD11 digital microwave radio in the bay area. Allnet and Sierra Microwave also launched in the late 1980's with services into San Francisco. However both of these companies deployed a much larger network extending south along US highway 101 (Allnet), north (interstate 5) and east (interstate 80) by Sierra Microwave. At the time of their deployment, Sierra was

[2] **ILEC** – Incumbent local exchange carrier, the telephone company in place prior to deregulation. The dominant ILEC (in the Bay Area) is now known as SBC Pacific Bell

getting $50,000 a month per DS3 between San Francisco and Sacramento and quickly filled their radio with 18 DS3's.

In the mid 1990's, these companies were merged into larger companies, and their names changed. Bigger corporations who lacked understanding of premium service that BAT/Sierra/Allnet had pioneered, in effect tarnished their previous excellent reputations, by giving poor service. Coupled with the higher costs associated with radio maintenance, all 3 networks had become essentially deserted by the end of 2000. Secondary owners, such as Mountain Union Telecom, acquired portions of these networks, mainly the sites themselves, which they operated as a landlord, rather than owner-operator.

II.
Wireless Power

The first commercial development of microwave radio transmission was made practical in 1948 when Western Union Telegraph Co., and shortly thereafter by AT&T, built transcontinental networks of radio stations. These "long lines" networks had up to 75 repeater sites to span the continent. At that time they represented a significant advance in the state of the art of long distance services by creating the first use of what we now know of today as "broadband" technology.

AT&T, in particular, capitalized on this by expanding their capacity using different frequency bands and clear aperture[3] antennae to solve the nation's needs for Increased traffic. Their sites were built, more than any other carrier, to withstand earthquakes as well as the test of time.

In the 1960's AT&T Laboratories developed the beginnings of today's digital technology with the advent of "T carrier" systems. They limited their scope, however, to "short haul", meaning between central offices in big cities where individual copper wire pairs were in short supply. Western Union was the first to develop a regional use for this technology, in the early 1970's, with the use of special purpose "T screen" cable.

The telephone and telegraph monopolies were challenged by two significant events, one political and one technological. The political of course was the great breakup of AT&T, and the technological was the invention of true digital microwave, both in the middle 1980's.

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[3] **"Clear aperture"**, an antenna type that keeps the path inside the antenna clear of obstructions. These devices, also called "horns" look like a cornucopia device mounted on a hilltop, are heavier, more cumbersome and expensive than standard antennae. The trade off is for improved performance.

There was also work being done on making practical use of laser for fiber optic cables. The investors behind BAT knew of this, yet decided to concentrate on taking a unique approach. Their efforts produced a regional based carrier that utilized the essence of the terrain in the San Francisco Bay Area: "hill top to building top" to both bypass the Bell operating company and to extend their service to other carriers. BAT also combined this with a long distance service via satellite to offer a "best business connection" and a bypass solution to those firms needing more than usual telecommunications.

The technological pendulum has swung back and forth between wire and wireless over the past century. Fiber, it was touted when introduced, would finally put wireless in the museum. If you take a look at a head-to-head competition between long distance radios versus fiber, you quickly see their point. Beginning with capacity, coupled with the FCC's lack of allowing new advances into the domestic US microwave market, fiber is no question the hands down winner. A single pair of fibers can now carry dense wave division multiples (DWDM[4]) traffic of 40 OC192's, which gets into astronomical amounts of capacity, allowing the giant long distance carriers to offer telephone service at pennies per minute. Because the technology is newer, the mileage between fiber repeaters now approaches 40 miles. Finally, fiber now dominates the field of long distance because of the decreased cost of maintenance per repeater when compared to microwave.

Yet all is not rosy in fiber. The immense costs on obtaining permits in large cities, of digging up the streets and even finding space in urban undergrounds already filled with other pipes have driven many companies to lease space instead. Herein lies the rub—While these giant telecommunication money machines advertise services to compete, operationally they are all using the same conduits and sheaths within conduits together. This means that they all share the same common entrances to certain buildings in downtowns that have come to be called "carrier hotels", because so many companies share space. Landlords of such buildings have formed consortiums that now charge these companies to install conduits between suites. Sharing conduit space with your competitor means that moves changes and additions become common knowledge, and common interruptions frequently occur.

Another problem with fiber cables is the way that splice cases, where fibers terminate, are often mounted in a hurry and not seismically secure. The author has personally witnessed a major carriers splice case in an underground fault, unlabelled, and standing on the wall inside a competitor's space. When pointed out to the Vice President in charge, with a photograph, his response was that "the case should be locked". To my knowledge, it never was. Local

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[4] **DWDM** – Dense Wave Division Multiplexing.. A variant on a well-proven technology, allows stacking DS3's together in ever increasing bumbles to where the aggregate reaches 400 gigabits per second.

technicians knew that any pocketknife could open the cage, and that many carriers had the same situation in their access.

Fiber has also suffered from excess capacity and poor documentation as carriers have been sold and merged. Many installations are not secure from floods, which can bury cables in mud underground. The ILEC may or may not notify their competitors of such dangers. Not having control over their own underground conduits has caused some carriers, such as XO, to invest in building their own.

Last, and perhaps most important, is that fiber does not apart well to local distribution. A recent survey by a fiber carrier found their "lit buildings" in the bay area was .05% of total business buildings in the market. The estimated cost, IF the fiber was running down the street, AND there was a manhole with their fiber in it, AND in that hole was a splice case, the cost involved was $30,000 to bring it into the **minimum point of entry** (MPOE[5]) in the basement. Thus the sales forces for such companies are limited where they can sell without using the Incumbent local exchange carrier (ILEC) for the "last golden mile" of service.

The solution that most have adopted is to rent a 10 x 10 x 10 foot cage inside the ILEC's central office for $15,000 a month and then get the ILEC to crossconnect the service to their local copper cables. This "last mile" drives up the cost to where the customers to where only major carriers have the customer base to operate profitably. And the **Competitive local exchange carrier** (CLEC) must also have fiber pulled into that location as well. ILEC technicians have been known to cut crossconnects running between cages because they have exclusive rights of connectivity.

Mergers and acquisitions have spelled major trouble for the industry. The author was witness to the fact that WorldCom, although they had acquired MCI, Wiltel and MFS, could not connect a DS1 service between suites in a carrier hotel in San Francisco earlier this year. It took local knowledge, not only of the carriers and their relationships, but of the history of who connected to whom a decade ago, to find a simple solution for the customer.

Microwave radio has inherent advantages to solve regional carrier access problems, serve specialized access customers, and act as an ILEC bypass while maintaining control. Compared to relying upon the competition or a third party, having exclusive right of access for backbone DS3[6] service starts to sound attractive. The FCC, when granting rights to the public airwaves in the form of a

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[5] **MPOE** -- minimum point of entrance. The point, usually in the basement, where telephone companies terminate service. Beyond this point it is the customer who must wire to their floor space.

[6] **DS3** – Digital Signal level 3, internationally recognized transmission standard, operates at 45.5mega bits per second, which is fast enough to carry 672 simultaneous voice telephone calls, 28 DS1 (or T1), or 2 High Definition Television channels with room left to spare. This is considered the base unit of wholesale connectivity.

license, guarantees that exclusive right of access. Their PCN[7] process is a form of industry self-regulation that actually works well in practice.

Microwave also has distinct industries where the prohibitive cost of laying fiber precludes major carrier access. Specialized markets have come from Utilities, Broadcasters and Wireless companies such as PCS and Cellular who need mountain top or tower access.

Giant money machines in Trouble

More and more companies outside of these industries are becoming fed up with the constant news from the media about how WorldCom has misstated billions and have shocked investors about their credibility on Wall Street. There is a basic growing perception that these merged companies have mis-handled customer service and overcharged their clients. More and more, as companies are brought into court on charges of fraud, such as WorldCom, or bypass paying landlord rents by declaring bankruptcy, such as Global Crossing, ICG, Qwest and XO, customers and investors are looking for a different telecommunications company. A company that has ideas about how it should be done. Ideas that are so old they must be brand new. A company with new ideas about ethics in business, customer care, and labor relations.

The time has indeed come for a regional based wholesale company to provide the ultimate ILEC bypass to ISP's and others who yearn for another way to communicate their business. A new BAT is what is needed, now more than ever.

III.
Capable Stewardship

Common practice by the giants today involves managing by statistics. Workforce performance gets judged not by how well the customer is treated, for that is too hard to quantify, but instead by meeting goals. WorldCom threatened to cancel a DS1 move in February 2002 because the CLEC they were dealing with could not come up with a CFA[8] in a single day. It did not matter that they had never contacted this particular CLEC before; just that their business cycle was ending a period and all work had to be turned in or be cancelled. It was only the customer who stepped in and allowed the work to continue, and then it took two additional months while different offices were considered, then dropped, as points for handoff. The CLEC finally took control and designed the circuit in

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[7] **PCN** – prior coordination notice. A process whereby prospective microwave licensees serve notice to existing carriers of their intention to occupy space in the air, on a specific frequency, between certain points. Once coordinated, and if no objections are received, only then will the FCC process the application.

[8] **CFA** – Carrier Facility Assignment, a technical specification of just where a circuit terminates in an office. Used as a reference point for handoffs between carriers to complete service end to end for a customer leasing from both.

offices where they had no POP[9], and between much larger carriers. The cutover worked, and the customer was satisfied with service instead of excuses.

Building a telecommunications wholesale operation requires a base of operations. A warehouse equipped with a functional test bed. A test bed where radio sets is placed back-to-back and stressed to find limits of performance. A place where technicians can bring in suspected defective equipment from the field and have it tested. There is a need to "practice" the art of maintenance, and perfect it before "performance" in front of the customer. "The shop" is a long abandoned concept where knowledge gets passed from journeyman to apprentice, and schools are held to teach new practices and perfect old ones.

From this shop comes written standards, agreed to by all concerned, along with documentation including run lists, rack face drawings and methods of procedure wrapped up together in an engineering package. The "construction and Installation" team meets with the foreperson daily before going into the field, allowing for instructions to be passed and details dealt with before going back into the field.

Cutover

When the "Construction & Installation" team completes its work, with all alarm wiring and circuits tested, a meeting takes place. The customer bears witness to the "maintenance and operations" technician taking control and responsibility by signing off an acceptance sheet that he is satisfied. Only then will the circuit become "revenue traffic" and billable. This ensures a definite separation between departments with differing timelines, performance goals and expectations.

A Microwave Secret

Technicians and engineers with a long history of practice know that the present "digital" standards did not evolve overnight. It was the providence of Western Union Telegraph Company to pioneer ones and zeroes, in the form of Morse code, in the 19th century. This long forgotten regulated monopoly used microwave as a basis for improving on wire by placing digital circuits on analog radio using "Voice Frequency Carrier Telegraph", or what is now called a modem, to save space and increase capacity over wires strung on telephone poles beside railroad tracks.

Digital microwave emerged to great industry accolades in the late 1970's. By the 1980's the Northern Telecom RD radio began to dominate the non-AT&T microwave business by building a model that operated digitally on top of analog. Because all microwave radio is built to "up convert" and then "down convert"

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[9] **POP** – Point of Presence, an office where a carrier leases or sub-leases space from another.

Because all microwave radio is built to "up convert" and then "down convert" signals, the rules of analog transmission apply. And because analog is still used, it is not a case of "black or white". Many shades of gray exist, where performance of an individual component slowly deteriorates long before failure. This radio has a built-in "NT45" analog history monitor that can, in the hands of a capable technician, yield numbers that indicate which module is becoming marginal. Every 15 minutes performance statistics showing phase hits, gain hits, impulse noise at three thresholds, as well as dropouts, clearly show performance of the analog system that underlies the digital. And this information is available remotely, at the technicians bedside, should he need it in the middle of the night, telling him what component to bring with him when he has to go outside and gives confidence that time will not be wasted.

But such middle of the night events won't happen if the system is rigorously maintained during the day. And to track such events, three additional layers are added.

Performance Monitor

On each radio path, a DS1 (or equivalent) circuit is set aside. Like customer revenue bearing traffic circuits, it is given a number. And it has the highest restoration priority setting. At the ends of this circuit lie test sets, a transmitter and receiver set that communicate constantly over the link. And to each set is a SNMP[10] or serial link that reads the 15-minute performance test results and feeds these into a database for review by management in the Daily Radio Report showing network elements with less than 100% performance. This also is used to track system performance and generate proof-of-performance statistics for each customer every month.

Real Time Alarms

At each site, a remotely polled alarm device watches each radio, tower lamp, high and low temperatures, and door alarms. This in turn reports to the **Radio Operations Control Center** (ROCC) where a logging printer keeps a printout of each alarm. Network management software, in conjunction with the **Simple Network Management Protocol** (SNMP) software, massages bursts of alarms and causes a red lamp to flash, indicating current service degradations exist, and alerting ROCC personnel to real time conditions. Major, minor and alert status is kept track of automatically and history reports can be scanned at a later date to correlate customer or management inquiries for chronic trouble tracking. All telecom companies have this equipment; few know how to properly manage the data.

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[10] **SNMP** – Simple Network Management Protocol, a standard to monitor and control network elements remotely.

Proof of Performance

Premium Service means just that, going the extra mile. Each customer will be given a web site to securely access a performance monitor of just his or her circuits. This consists of a "T-Smart CSU" at each end of their line that, in addition to performing standard CSU[11] functions, it also tests the line and monitors "hit counters" set to record at 15 minute intervals, any degradation of service, it's duration and direction of travel as well as severity. This alone should build confidence in the carrier. Should the customer be dissatisfied, or have a question, they can generate an outage report or ask a question and get a response acknowledging their service request input 24hours a day, 7days a week.

The Database to end all Databases

The essential difference between the premium service company being proposed and those in existence today is the way in which the relational database gets used. A **Structured Query Language** (SQL) database provides the following essential functions. Three separate programs draw upon one single set of integrated data:

A listing: Circuits and Systems

A1) Create assignment tables for each system between network nodes, or sites, included here. The color codes indicate revenue status:
RED--jeopardy, those circuits in revenue that the customer is not using.
GREEN--active producing revenue circuits and systems.
BLUE--found revenue, or projected to produce revenue. This comes from assumption of a network where the company that sold to us didn't keep good records. It is also used to denote new service being installed to reserve capacity, as well as circuits and systems on reroute or irregularity status.
A2) build (eventually by actually drawing) Circuit Layout Records, Design Layout Reports for each circuit and system.
A3) draw and populate building, tower face, and rack layouts for every network element in service.
A4) create run lists for cabling, alarm assignment tables showing tie cables, terminal blocks and demarcation points in central sites and customer field locations.

B listing: Trouble Desk

B1) Allow customers to enter from secure web terminals trouble tickets, be able to track outages, escalations and RFOs (reason for outage).
B2) Allow employees to enter customer complaints and track the same as B1, either remotely (from home) or at the ROCC.

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[11] **CSU** – Customer Service Unit, a device placed in the customer premises that allows remote testing to determine the nature of troubles and their location, whether on the network or in the customer equipment.

B3) Permit customers to view active status of each circuit, as well as 15 minute historical status for up to 90 days, on circuits with T-SMART or other CSU's having real time performance tracking capabilities.
B4) Provide automatic Daily Radio Reports summarizing system outages in summary form at the start of the RADAY (radio day) for ROCC and management.
B5) Control and manage the Irregularity Report showing systems/equipment or services on reroute or other irregular status.
B6) Track PMR (preventative maintenance routines) status showing each site PMR status, as well as the number of PMR[12]s performed by each technician. A sample PMR book for Mount Allison is included. This is the activity where the vast majority of technician's time will be spent.

C listing: Billing and Service Level Agreements

C1) Tied to each network element is a cost figure. Costs are rent, facility charges, utility charges, and PMR hours spent.
C2) Tied to each circuit is a revenue figure. Revenue is from tarriffed items such as facility, channel terminations, and contractual items such as excess customer-caused outage reports and temporary service connection charges. This is a tremendous capability to make us stand out from the competition. We can justify costs and expenditures from these two items.
C3) Automatic rebate generation to customer bills when we fail to provide them with service due to outages.
C4) Creation of billing statements.
C5) Status reports to management showing cost breakdowns of providing service by site, customer, service type. This allows profitability to be judged for each.

Organization

Capable Stewardship, in practice, means paying attention to the human element more than any other aspect of a premium service business. While sites, systems and equipment change, there must be a constant and continuous effort made to establish and protect a long term business plan. No asset the proposed company will have is more precious to meet this goal than the human element. Historically, stability has been met by allowing the workforce to join a collective bargaining unit. While this may mean increased initial labor costs, over the long term it actually saves money. How? By allowing the workers to unionize, their job security is increased. When there is a considerable investment in training, and in building up local knowledge over the years, in the mind of each technician and technical staff employees, it costs money to the company in terms of lost productivity when an employee leaves. When a new employee first starts, that person is a liability. They must become productive quickly in order to pass their probation period. Yet productivity during the first years comes at the cost of training, and increased management time spent in apprentice supervision.

[12] **PMR** – Preventative Maintenance Routine, a procedure run that prevents outages in advance.

By the end of the second year of operations, if successful in making money and on track to retiring initial startup costs, the new company will allow the workers to form their own collective bargaining unit and enter into good faith negotiations with management. This not only increases worker confidence, it also allows management to know, in advance, what their labor costs will be. It increases morale by letting the workers know wages, job descriptions, terms and conditions.

By allowing wages, terms and conditions to be known to all employees, the veil of secrecy between the work force and management never materializes. This freedom to publish information regarding labor relations keeps rumors from starting and morale high.

Yet labor relations are but the beginning of how information gets distributed with the company. Based upon the Bay Area Teleport model, every month a statistical review takes place. This shows the percentage of PMR's met, of projects completed on time and budget. Additional details like the percent of cost, per site, for each circuit, published in spreadsheet form, are part of the end result of the database described above. Of course this not only tracks figures such as rent and utility charges, but facility costs as well. This enables management to truly be able to understand costs of providing service when other companies only can guess.

Premium Services Concept

Telecommunications transport is the basic service, on a wholesale basis, provided. Yet, due to costs associated with preventative maintenance, added to fixed costs and overhead, provide little room for the profit margins that must be made in order to retire debt and provide fertile grounds for capital growth generation. This leads to the "heart" of this business—Premium Services.

Many customers find it a struggle to manage their own network. Especially when dealing with the ILEC, the inevitable moves, changes and adds are boring, detail oriented work few want to deal with. The typical reseller wants to simply sell service and grow their bottom line. Details of traffic loading and analysis, developing cost models based on artificial intelligence prove to be to much for all but the largest and well run operations.

This company has as at it's disposal the human elements to develop and deploy such premium service concepts, including a sales force with a 15 year track record selling microwave services on a commercial basis, in the bay area.

It's Showtime!

One concept the giant money machine telecom companies forget is how to make money! Nowhere is this more evident than in the area of temporary

connectivity. Wireless networking is just now starting, with the "Wi-Fi" concept, to begin to tap the relay-point on a mountain top or building to customer model. There is a whole different market, where, if the reputation is developed and rigorously maintained, profits are measured not by the month, but by the hour. There are many possibilities, but to simplify, we will discuss but two:

A salesperson from a major CLEC is close to closing a deal for a DS3 with a customer. The customer has a huge pent up demand for services and is tired of being abused by the ILEC. Yet they "wanted the service yesterday". The CLEC sales manager gets the call "can we promise service in two weeks?" The manager goes to the circuit provisioner whose monthly quota hangs by a thread.. The provisioner can only call the ILEC, who has that famous golden last mile sewn into their vest pocket, and beg for the expedite. The ILEC, of course, takes the lead from the CLEC provisioner and in turn passes it to their sales force, who, of course, sells an expedited connection and gets the DS3 despite the customer wanting to go elsewhere. It's true, it's not fair, but it happens.

Yet, where there's a will, there surely must be a way. That is called a non-penetrating roof mount and a quad-pod stand borrowed from the satellite industry, coupled with Nashua 357 premium grade duct taping the wires across the sidewalk and into the customer's switch or data center under the side door. Or perhaps the location is in a hole, away from the line-of-site to a microwave backbone location. In that case a truck with a pole, similar to a TV stations remote news gathering truck, gets parked nearby, as a repeater.

This whole concept of rolling a DS3 out the door and having service within 24 hour's notice to the customer, who wanted it yesterday, takes extensive training, rehearsal time to practice, and an organization dedicated to this type of service. Yet it has been successfully deployed in the bay area, by a company called Watson Communications. The idea is to sell service bypassing the ILEC and their disclosure of confidential sales leads, and turn a temporary connection into a permanent one. And the customer will remember it long after the truck is gone.
A permanent steerable antenna is mounted on the tower above the cities to be covered, pointed to the proper directrion by the ROCC.

Emergency

A suitable use for the temporary antenna system is in emergencies. An emergency can be an outage on a fiber optic cable, or disruption by any other means. A rehearsal needs to be done, like fire departments, practiced and procicient, and ready to respond at a moment' notice. Once the facilities are in place, we will offer reroute capability to other carriers who have needs and are willing to pay premium prices to save their reputation and restore confidence. Likewise, we intend to offer restoration services to government agencies and

plan with them for use of the **protect channel** (PROT[13]) during times of earthquake or oher regional emergency. Microwave is so versatile, more easilyt steerable, that an **Optical Channel 3** (OC3), or 3 DS3's, can be set up within hours, depending upon terrain, to a truck as described above.

Surgery

A medical provider wants to show open heart surgery at the Mark Hopkins Hotel in Downtown San Francisco, in the penthouse "St. Francis" room. They want a temporary HDTV feed, which is only 1/3rd of a DS3 in speed, to about 25 surgeons. The only way they can get their service is to schedule an uplink truck and satellite feed to the roof of the hotel, today. The ILEC cannot run fiber up 16 floors, even if they could pull city permits to do the underground. This company could compete with satellite, and provide something satellite cannot, a two way video circuit. Satellite only does audio, via phone dialup, for the real time interaction necessary to sell the hospital the latest technology. Either that or fly all the medical staff to a convention in New York.

Again, as with sales to provide premium services to the standard telecom provisioner wanting competition who keeps it confidential, it is practice in private and performance in front of the customer that pads the bottom line and takes much fuller advantage of the fixed costs of tower rent, than currently considered.

Conclusion

Such are the possibilities, as seen in real life practice, here in the bay area, that take advantage of those nearby mountain tops. By intelligent reuse of a fixed asset, such as a tower, and marriage of the many historical ways that microwave has played such an important part, are all possibilities. These are the goals for a company who takes all of what worked in the past and makes profit in the future.

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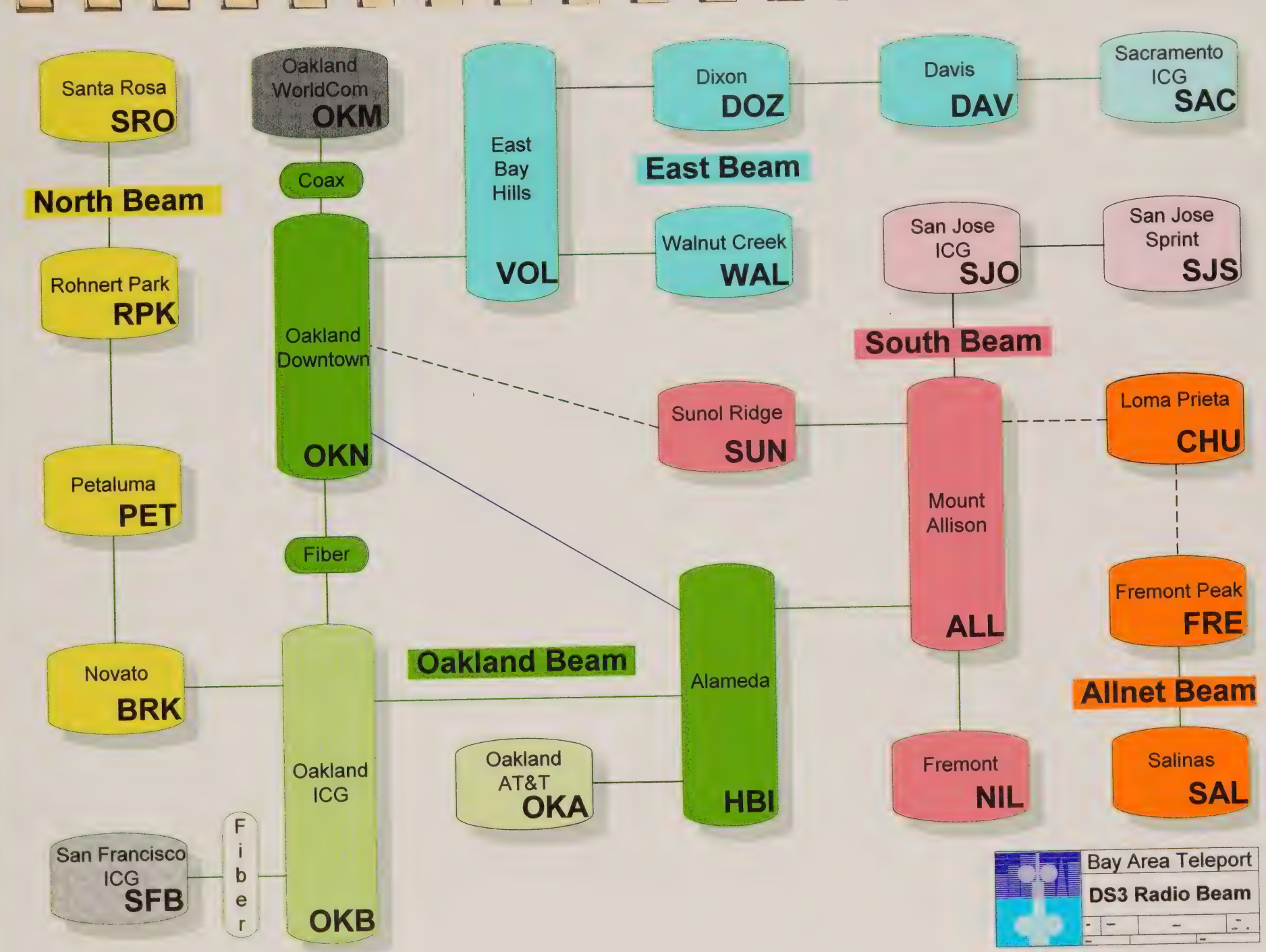
[13] **PROT** – a non-revenue reserve channel operating continuously along regular channels to allow maintenance without disruption. Unlike fiber, radio offers "hitless" switching to protect, and this concept allows many "working" channels to share a single protect during adverse atmospheric conditions.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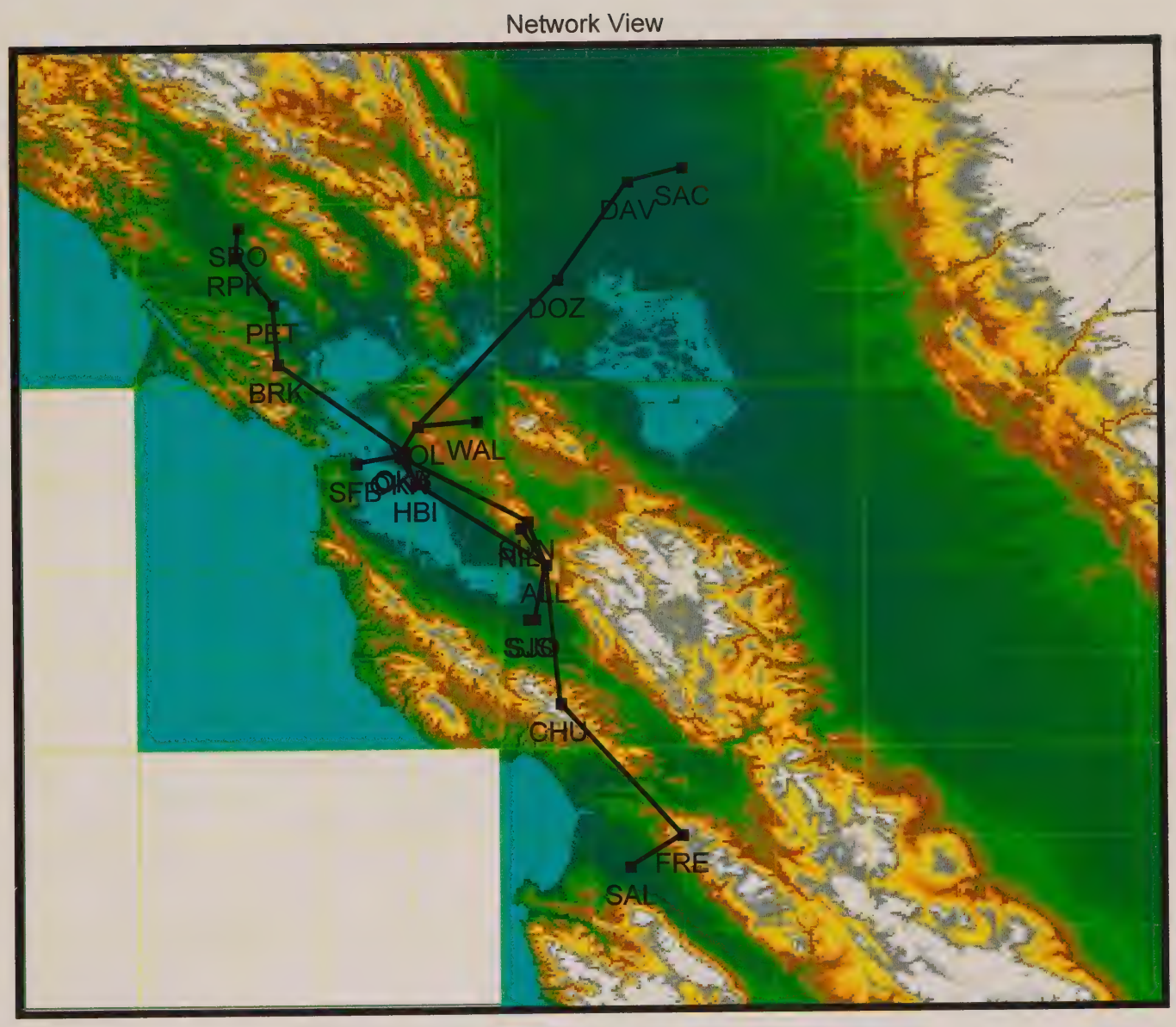
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Back Yard Feed Test

An informal study of C band feeds in 2003

By Tim Alderman

Background

In June 1984 I read a magazine article that changed my life. It spoke of signals crossing borders, which I had heard as a child with short wave. Determined to find the best, I went to fifteen TVRO showrooms in my area, and was thrown out of two because I intimidated the salesman with my loud mouth full of technical knowledge. I finally found Myron Cohen, who was the only dealer willing to come out to my back yard to do a site survey.

We became friends while I completed a 5-month after-hours free apprenticeship to learn how to install dishes and feeds. I kept my "day job" in telecommunications while volunteering to build a satellite dish owner radio talk station at night. When I lost my day job, Myron hired me to crawl under rich people's houses. Every time I get laid off in telecommunications I have a job to fallback to. I also taught feedhorns in a seminar to eager students in Auckland, New Zealand in 1996.

Myron and I always had differences of opinion when it came to the feedhorn. I was a firm believer in the National ADL brand, while Myron used "Brand C", which had 80% of the market.

The RP1 is a designation for the moded feed type which gives a slight (about .2dB) improvement over the more common scalar ring design used by all other feedhorn companies except Miralite. Gerry Blachley, the owner of National ADL, told me he was forced to introduce the RP3 scalar ring to make his feeds look more like the competition. The RP2 he also was forced, he said, to introduce to meet the "gold ring" deep dish designs then becoming so popular. The RP1 was, and still is, a shallow dish feed with superior sidelobe performance, all other things being equal.

Gerry sold National ADL. The name was changed to Patriot ADL and moved back east.

Feedhorn Disaster Strikes

This past fall, after many turns and twists in C band TVRO, Myron once again hired me, I was once again out of a job. He decided to try my brand and he bought a Patriot ADL RP1-OR100 feed. I have been using an original National ADL on my dish for over a decade. I tried this new Patriot feed on a friend's dish with disastrous results. At first I blamed myself for this when I discovered errors in my workmanship.

I next took that Patriot feed to a customer site, thinking I would get the same performance as I had enjoyed with my National. After all, they were supposed to be the best feeds with dual LNB's and the highest cross-pole isolation available in TVRO, for simultaneous dual polarity usage. Five hours on the job site later, I gave up and went and got a "Brand C" feed from Myron's boneyard. The results made me eat crow when the dish performed like gangbusters. I decided to take a day off and do some tests.

Analog test results

Using my own backyard dish, on satellite C4, I discovered there were two opposite polarity in-the-clear shopping channels on transponders 9 and 10. C4 also has 4DTV digital signals, including my new favorite, Discovery HD theater.

I removed my National ADL RP1-OR100 and swapped in the feed which has suspect. Immediately I noticed a substantial difference in polarity. The Patriot RP1-OR100 would not properly cross-pole null polarity. As I was testing, with a TV set to monitor analog on one pole and my spectrum analyzer to observe the other, I had, at one point, removed power to one LNB. Immediately the other LNB acted differently. I could polarize the feed normally. Checking further, I found that applying power to the second LNB caused interference to the first. The cross pole null rotated about 45 degrees and it lost about 3dB in signal. This caused sparklies on all transponders.

I know that MSE was the last LNB manufacturer to use input isolators, and that they went under about a decade ago. However I have a pair so I tried them and found that indeed the one Norsat Digital LNB was causing interference with the other. I measured the loss of polarization at an astounding 17dB with 3dB additional insertion loss. There are no LNB's being manufactured today for TVRO with isolators.

Having discovered the source of my problem, interference, I went onto test yet another brand new Patriot ADL RP1-OR100, this one lacked a center tube, but was still basically the same indirect waveguide design. It had slightly less insertion loss but still no where the benchmark performance of the National ADL with the same model number. It also exhibited interference, but again, was less.

Next I decided to expand my tests and try both historical and modern feeds. All feeds are C band only, and all are dual polarity, except the "brand C" superfeed. The Patriot ADL RP3-OR100 was almost as good as the National RP1-OR100, but still exhibited slight, very slight interference as well as had 1dB more insertion loss.

I next dug out of my boneyard an original "Brand C" superfeed, which is single polarity and has no scalar adjustment. The mouth of this feed is set for a .4F/D ratio dish as it sets in flush with the outer rings, definitely a shallow dish feed. As expected, it was slightly better in cross pole isolation than my reference National ADL feed.

Finally, I found a Miralite "Miracle Feed" dual polarity feedhorn and decided to use it with scalar rings. The Miralite actually uses a moded feed like the ADL RP2, which is deep dish territory and not in my back yard. However it also fits in the Patriot ADL RP3 scalar. It's performance was very nearly equal to the National ADL RP1-OR100 and perhaps very slightly better. As it's throat is adjustable, I was able to confirm that 1/8" past the scalar ring was the proper place. To far in and it started to lose gain. To far out and it was picking up over-illumination noise.

These tests were done with analog signals as well as observing a SCPC digital carrier which made a nice flat topped signal for cross pole and insertion loss measurements.

Digital Tests

4DTV has several feeds on C4. I used "TV Game show" which is a horse racing channel. Something nice and stable but which I would normally never watch. The receiver allows me to check both signal level and distortion level by way of a digital error rate indicator. The higher the number, the better the signal strength for the first number, and lower distortion for the second. 100 is deemed "perfect" arbitrary figure. (all pictures clear except where noted)

		Power applied to 1 LNB only:		
Brand C	National ADL	Patriot ADL	Patriot ADL	Miralite
Superfeed	PR1-OR100	RP1-OR100	PR3-OR100	Miracle feed w/scalar
96	96	95	95	96
95	92	51 (picture tiling)	86	95
		Power applied to both LNB's simultaneously:		
N/A	NOT TESTED	96	95	NOT TESTED
		1 (black screen)	85	

Conclusion

Both analog tests and digital arbitrary numbers indicate that Patriot has compromised the National ADL design. Range tests need to be done to confirm this and provide a more exact set of numbers. However, with my feedhorn experience, coupled with today's lack of isolated LNB technology available to TVRO, I would say that the edge formerly enjoyed by National ADL when Gerry Blachley owned the company has not been retained by Patriot.

There are other factors, such as price and the more powerful servo motor that used to be in the National ADL single LNB feeds, may affect your C band TVRO feedhorn purchase decision.

Digital Private Cable

Microwave Engineer combines latest technology and years of experience to provide free to air signals in heart of "cable country"

By Tim Alderman

I had been called out to do a "TVRO site survey" in the Oakland Hills by a customer who wanted me to locate a spot for a satellite dish he had moved from another location. It was a mess, a literal pile of rubble that I saw behind a grove of trees. An 8' dish, still assembled, and a "superjack" pulled apart. Obviously taken down at the old location by someone who had no experience. The feed had been removed, and in the process, the Ku waveguide had been broken. I found his old one-run cable in knots. Amine Nebri, the customer, was a computer programmer who decided he wanted to keep his C band dish rather than subscribe to cable.

Walking around the yard with my *Gourmet*-Entertaining Sat-Site tool, I located two spots where the arc was fully visible, if only a few branches were trimmed. The steep hillside meant the dish would be far down the hill, and away from potential conflicts with neighbors. We quickly settled on a spot and left a marker where the pole would go. I also looked at his house, and decided that the best way to distribute was to re-use his existing cable, installed by previous owners. The whole neighborhood had been burned out during the Oakland Hills "firestorm" of 1991, which had taken 2500 homes and 30 lives. The retaining wall, next to where the pole would go, was a blackened reminder of what remained. Everything else, including the house on 4 levels, was less than a decade old. The house was cabled to a central location in a sub area near the top with 6 home runs of RG6.

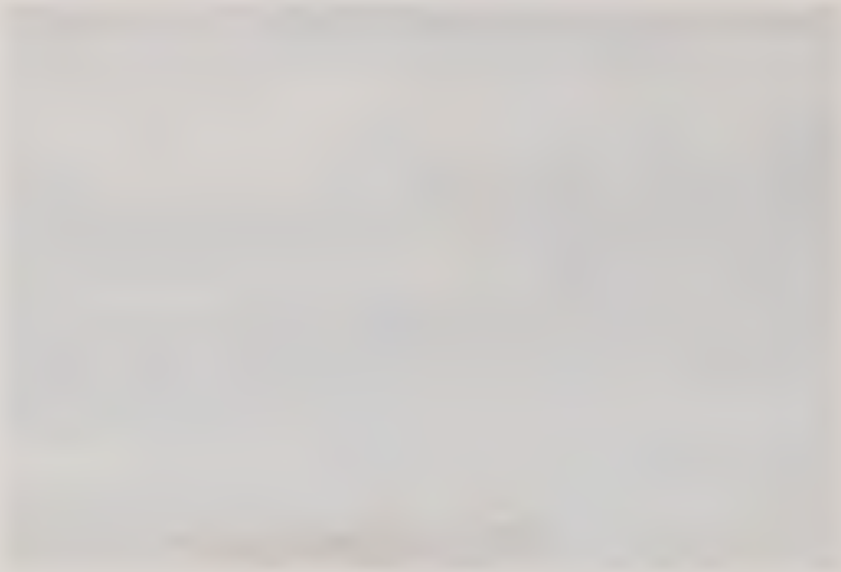
While walking the property and making decisions about equipment placement, Amine raised the question about disconnecting cable and using it for internet service only. I agreed to provide a quote for both re-installation of his dish and bringing in local off-air TV, and combining both with local modulators to create a classic "private cable" for his family, and get him off the monopoly. He was to do all the "grunt work", installing conduit, running wire and erecting the antenna on his roof. I provided an estimate based upon this scope of work request, 15 hours for the dish at $750 labor, and another 15 for the antenna, at $450 labor, plus parts, and a complete block diagram upon job completion.

We also agreed that this was to be a "digital only" system for off-air reception, after explaining recent developments in off-air television where all the local broadcast channels were duplicated on UHF of the traditional VHF analog assignments coming from San Francisco's combined transmitting location called "Sutro Tower". I also knew that one channel, KCSM, a PBS affiliate, was still broadcasting from the older tower farm at "San Bruno Mountain" which is about 10 degrees of antenna orientation different than Sutro, from his location. I went to a local electronics store that still carried outdoor antennae and purchased a UHF double-row-bow-tie antenna suitable to pick up both. As I already had a Blonder Tongue VHF yagi antenna for cut channel eleven, brand new in a box,

for the single San Jose channel, I didn't need to buy another. I also knew that that San Jose channel, KNTV, had taken over as local affiliate for NBC, and that they used VHF channel 12 for their digital signal. As he wanted all the principle networks to choose from, we agreed my quote would be for two antennae on his roof.

Before construction could begin, I insisted a "signal study" be done to determine the exact channels possible. I brought my own ATSC tuner and monitor out and together we set it up on his roof near a chimney. I brought a ten foot pole and the two antennae and connected them. I was surprised to find that, half way down a steep canyon, his UHF reception was spotty at best. Digital signals either work or they don't. There is no "ghosting". What I found was that it took me half an hour, using my spectrum analyzer and the ATSC tuner, to peak the Sutro/San Bruno Mountain signals so both were available. The strength of the signals was such that it took a long time to "sync in", or acquire the digital channels as I tuned from one to the next. Then I found "tiling" which is much more objectionable as a marginal signal than ghosting is on analog. I also noticed the signals on my spectrum analyzer indicating that knife-edge diffraction was present, as there was a "comb filter" effect as I slightly rotated the antenna, causing some channels to vary in strength by up to15dB. My local knowledge of these same signals is based upon my own rooftop, which is in the flatlands about a mile west of the Caldecott Canyon, where Amine wanted reception. My signals average a +25dBMV, which is enough to roast a turkey, and require directional coupler attenuation before presenting to my two televisions.

Fortunately, the Blonder Tongue VHF eleven antenna worked looking southwest towards a ridge line just blocking Loma Prieta, site of the 1989 earthquake, but more importantly, the transmitter location, some 40 miles away. The channel 12 digital signal immediately "popped in", despite being on the band edge of a channel eleven antenna. Such is the nature of VHF reception. Later on, I discovered that he also picked up a second NBC affiliate, KSBW in Salinas,



off this antenna, from a transmitter on Fremont Peak south of Gilroy, an additional 50 miles further south. But that signal was analog, and a bonus free channel, as my commitment was strictly for only digital.

So, we had obtained spectacular digital from distant VHF and lousy local UHF from the signal survey. In addition to the variations I saw on the local UHF, due to knife edge diffraction, the overall signals were in the –15dBmv region from both antennae. Yet the KNTV-12 digital "popped right in" while the San Francisco/San Bruno UHF signals waited for several seconds while the ATSC tuner struggled with error correcting the signals.

The antenna from the local store was returned and while there I talked with the staff and other customers who knew of Caldecott Canyon. They told me I was crazy, that canyon was a "white area" for rooftop antenna reception. I next went to another local retailer looking for a fringe UHF antenna from Winegard, a company with a history of fighting cable to deliver free signals to American households. When the owner, who had 40 years experience in the business, told me I was flat out crazy, Charring Cross, the street Nebri lived on, was, he said, a street he wouldn't touch. A quick eyeball of the rooftops in that canyon confirmed this was indeed cable's home turf and territory.

I had built a reputation on difficult reception issues, having brought the first legal reception of CNN and MTV into what was then the Soviet Union. On the roof of the Communist Party Central Committee's Moscow hotel, a decade before, I fought not only being 1500 miles outside the Ku satellite footprint, but had to contend with interference from a local in-band terrestrial microwave signal some 50dB stronger. I managed to use my childhood knowledge of how signals worked around knife edges by using the copper roof to catch MTV while avoiding

the same frequency coming in locally, by moving the non-penetrating roof mount a fraction of an inch at a time. To me, this local "white area" reception hole made the design a challenge.

I needed at least 25dB gain from a UHF antenna, and beamwidth well under the 30 degrees quoted for "deepest fringe digital" reception currently available. I knew the answer was a dish, a UHF dish. Only a parabolic or spherical, from the Oliver Swan era, could do the job. Yet this dish also had to be mounted in a "normal" fashion, on a pole, so weight and wind loading were constraints, not to mention appearance to the neighbors of some gargantuan device in their neighborhood.

Back in ancient times, Channel Master made model 4251, a seven foot parabolic reflector that met all of these conditions. It was light weight, broadband, and had relatively narrow beam and at least a 20dB front-to-back ratio. It was also discontinued. Having one on my roof for 20 years, I knew it was a real deal. But where could I find one? Well, a decade before, I had sold one to an old friend in Nice, CA, in a true white area. But he never installed it, off air not being his interest. I also gave him a Paraclipse 12 dish for C band, which is all he wanted. At some point, he threw away the feed, but kept the reflector and button hook, as they had not rusted away. I managed to convince him to give me the worthless reflector, and I took the feed off mine and took it to a local welder to see if he could duplicate the backplane out of wire. He did a magnificent job for a mere $75, even the bent spokes that held the double stacked V dipoles.

I then went to a local hobby store and bought Teflon plastic in 3/8" thick block for $10. Carefully tracing the outline from my feed, I duplicated this insulator, and followed that with aluminum sheet I cut to match the pickup elements.

Next was to test this new feed on my existing rooftop to see if it matched the performance of my existing feed. Not only did it meet, but it beat it by 1.2dB in signal strength. I checked out the cross-pole isolation by rotating the feed while watching the spectrum analyzer on the ladder at my feet, some 40 feet up. I was surprised to find that the cross pole null was at least as good as a C band

polorotor feed, surprised to find the in phase peak was rather sharply defined, and that the TV stations transmitting digital all were horizontal polarity.
Next, I hung the feed in free space to find the feed's true front-to-back ratio was also equal to 20dB and the cross pole was also a healthy 23dB. Yum..

Finally, I had something, but not enough to get the signal from Amine's rooftop and all the way downstairs to the sub area. So I ordered a Blonder Tongue UHF line-powered amplifier and power supply. This enabled me to boost the entire UHF band and give some headroom for the inevitable attenuation I knew I'd have to deal with from knife-edge diffraction I had discovered deep in that canyon.

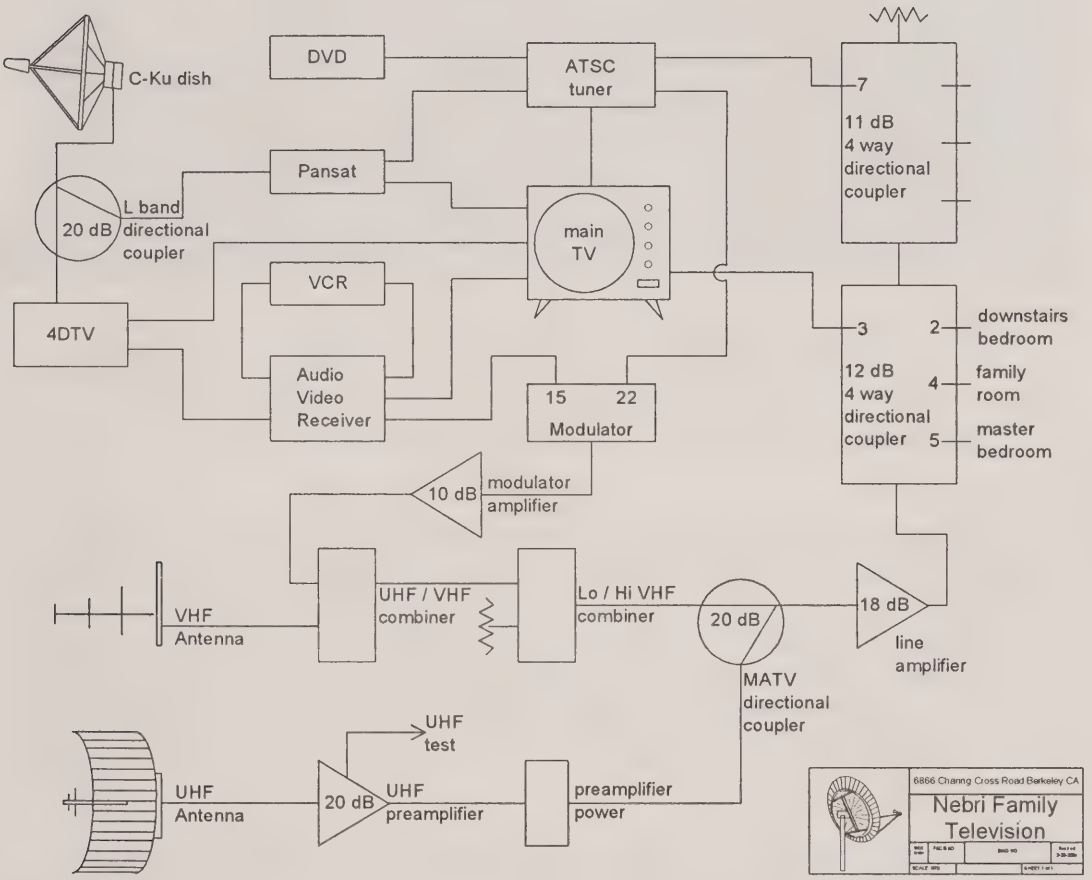
In the meantime, Amine asked me to take over the conduit installation as he was to busy at work, and I was otherwise unemployed. I kept careful track of these as "change order modifications" to the original quotation, for my bill.

When the equipment arrived, my custom feed was ready. I mounted the dish and put the VHF yagi right below it on a 20 foot pole I had saved from a second stack I wanted to erect on my own rooftop, but which unemployment had cancelled. I erected the stack on his roof instead, and the following day came back to find the winds that came up suddenly had almost ruined my carefully laid construction plans. A quick call and he approved a third change order modification, a "wind kit" that also came out of my boneyard.

Setting up the guy wires, I noticed that when I tilted the pole off plumb, pointing the UHF reflector up the hill, the knife edge hole deepened. But what also happened was the overall gain increased by 2dB. I measured the look angle with a roof pitch angle pointer and found the roofs of the houses that formed the knife-edge some 1,000 feet away was only 8 degrees. I took down the heavy galvanized upper section of the mast and substituted a standard EMT pole, which I pre-bent to that 8 degree angle.

This produced actually a 3dB increase, and I was also able to rotate the entire reflector on the mast, and found that the horizontal polarization from Sutro Tower was off by 2 degrees. This enabled me to further increase the knife-edge

effect, and thus pointing the stack in the right direction, I got an additional 2dB of reduction of the highest level signals. Thus I sacrificed most of the gain from pointing the stack up the hill to get a more balance of signals to the pre-amplifier. Blonder Tongue said their amp had a high input signal overload capability but I wasn't taking any chances. I needed to be sure enough strength to be certain the digital ATSC tuner that Amine bought would not start tiling when the winds picked up.



Down in the sub area, I built a mini-headend. During the process, I found that a local FM radio station, located on the ridge line just behind the Blonder Tongue yagi, was pouring a ton of signal into the VHF download. Left unchecked, it would eat up at least half the power bandwidth of the MATV amplifier I had chosen. So, I inserted a Blonder Tongue MLHF multiplexor backwards, and terminated the VHF-Lo side with a 75 ohm terminator. This lowered the 94.5Mhz FM signal to 6dB less than channel 57, my highest frequency digital signal. And, I had an agreement that this was a digital ONLY system, so any analog signals that came through were strictly a bonus.

I had done such a superb job in getting UHF gain off the rooftop that I discovered the unamplified VHF was 20dB lower, as were the local UHF double-sideband consumer modulators coming back from his living room. I merely used an old trick, a directional coupler run backwards, to solve the problem.

Finally, the whole thing needed some gain, to make up the loss of the directional couplers to distribute signals to the sets. I chose low loss directional couplers and a low distortion MATV amplifier to drive them. In analog television, low signal levels mean noise or snow, especially on UHF, due to poor noise figure RF stages. With digital RF, it's the bit error rate that counts. Signal levels of minus10dBmv just mean that the digital tuner's internal AGC level is increased. So low distortion is much more important in the digital world than signal strength above zero dBmv.

My calculations proved correct, to the customer, his ATSC tuner delivers picture in under a second, and it translates the digital channels to the older VHF assignment as well. This gives him all the advantages of digital with out having to memorize new channel assignments. Plus the ATSC tuner runs a channel on his local modulator, where anyone in his house can tune in on analog channel 22, and the TVRO is on channel 15.

Finally, private cable gives him growth capability. By adding additional ATSC tuners, individual sets can tune in different channels from the main set, and only cost is for the tuner itself, now down to around $300. All ATSC tuners also are capable of HDTV, and when he is ready, his private, free flow of information, digital system is already there.

I am proud to have delivered exactly what the customer wanted, and deliver it for modest cost, and he will never have to pay cable again.

Digital Broadcast TV Table by frequency in Northern California

Freq	Air	Assign	Azm	FCC Call	Network	SAC	BAY	SJO	SAL	City/comments
192	10	8	134	KSBW	NBC				X	
204	12	11	139	KNTV	NBC			X		
210	13	35	134	KCBA	FOX				X	
494	18	19		KUVS-TV	UNI	X				Spanish
500	19	20	224	KBWB	WB		X			
512	21	31		KMAX	UPN	X				
524	23	22	320	KRCB	PBS		X			Rohnert Park
530	24	7	224	KGO-TV	ABC		X			
536	25	13	41	KOVR	CBS	X				Stockton
548	27	26	204	KTSF	Ind		X			Chinese
560	29	5	224	KPIX-TV	CBS		X			
566	30	9	224	KQED	PBS		X			
572	31	67		KSMS-TV	UNI				X	Spanish
578	32	46		KION-DT	CBS				X	Monterey
584	33	32	224	KMTP	Ind		X			
590	34	66	224	KFSF-TV	TFA		X			Vallejo/Spanish
596	35	3	40	KCRA-TV	NBC	X				
620	39	38	224	KCNS	HSN		X			Shopping
632	41	65	204	KKPX	PAX		X			Religion
644	43	43	224	KCSM-TV	PBS		X			
656	45	44	224	KBHK-TV	UPN		X			
662	46	58		KQCA	WB	X				Stockton
668	47	68	306	KTLN-TV	Ind		X			Novato/Religion
674	48	29		KSPX	PAX	X				Religion
680	49	48	121	KSTS	TEL			X		Spanish
686	50	54	121	KTEH	PBS			X		
692	51	14	121	KDTV	UNI			X		Spanish
698	52	36	121	KICU-TV	Ind			X		
704	53	6	39	KVIE	PBS	X				
710	54	50	326	KFTY	Ind		X			Santa Rosa
716	55	40		KTXL	FOX	X				Stockton
722	56	2	224	KTVU	FOX		X			Oakland
728	57	4	224	KRON-TV	Ind		X			
734	58	25		KCAH	PBS				X	Watsonville
752	61	10	41	KXTV	ABC	X				
764	63	42	64	KTNC-TV	Ind		X			Concord

Freq Air Assign Azm FCC Call Network SAC BAY SJO SAL City/comments

TO MUCH SIGNAL

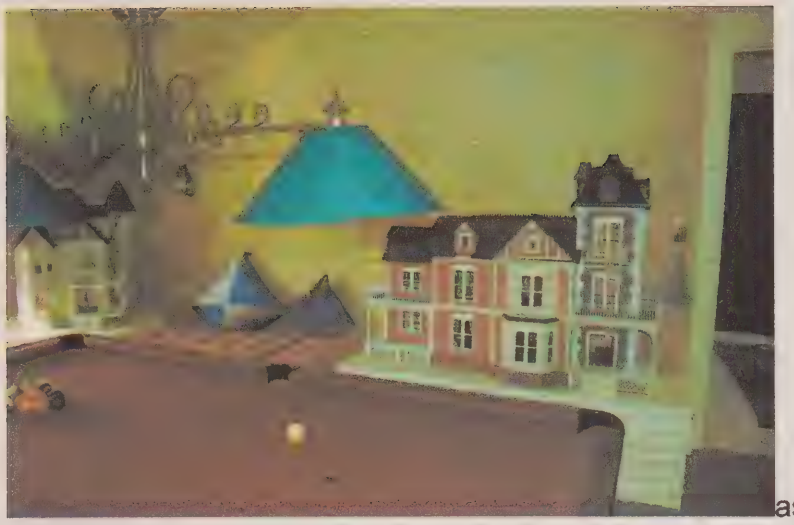
Editor's note: Contributor Tim Alderman is, without exaggeration, one of the top 'field hands' in the TV reception world in the USA. And that includes both satellite and terrestrial reception. Calling in Tim is akin to asking Red Adair to show up at your oil well fire after you have exhausted all possible techniques to put the blaze out. When Tim finds it difficult, you can but imagine how lesser skilled individuals are faring with the "Great American Switchover" to DVB-T.

...

"Take it out" cried the customer. "If you cannot get it to work properly, I don't want it in my house." His "house" was one of those upper crust San

Francisco Victorian mansions, the kind you see portrayed on television when they want to show you how "the other half" lives. In fact, the other "1/10th of 1%" would be a more apt description. Think of luxury, square it, and then take it to the tenth power. There I was in my grubby work clothes at the foot of a 50 foot long marbled staircase pondering, "How do we fix THIS one?"

The problems were many-fold. The client, if that is the descriptive phrase, of my sometimes employer Myron, was faced with integrating the output of a DirecTV Ku-band dish system with a plurality of off-air DVB-T channels such that the viewer would find it all 'seamless' - simply push the appropriate button(s) on the IR and on the 42 or 60" Plasma screen appeared the channel of choice. People "this wealthy" have a very low tolerance level for being asked to either "think" or do anything that involves more than one sequential step (for example, 'push 34 and then push AV' is asking them to do more than they are willing to do). There are Videophiles (who love to push buttons in some complex sequential stream) and there are average folks - rich 'average' folks who simply cannot be bothered. When you are brought up,

 as this client had been, with servants providing their every whim at a snap of the fingers, a TV set that requires more than one action to select a channel is unacceptable.

Problem number one: San Francisco's primary TV tower is called 'Sutro Tower' and it is located such that signals travel far (100-150 miles), strongly, as far as Nevada (get out your Atlas; it is akin to watching Sydney in Queensland). And the client's "Victorian mansion was not more than a mile (1.62 km) from Sutro. Take a normal TV antenna, connect a #47 light bulb to the driven element, and read by the energy generated! So every inch of the Victorian was "hot", so much so that quad shield cable was barely - if in fact - adequate to prevent direct pickup (never mind that the F connector on the rear of the Plasma screen TV sets had 6 inches of RG59 miniature connected to it in the run to the tuner - and you can be sure nobody in Japan in designing this set ever thought about making that six inch chunk 'quad shield'!)

Myron had been the 'third choice' after two previous installers had clung for their life on 70 degree pitched slate roofing installed in 1880 or so. This was one of those jobs where the customer says, "I don't care what it costs - just make it work!" and the installer responds, "I don't care how much money you 'throw' at

this situation, it ain't ever gonna work to your satisfaction". Of course being a mile from Sutro was a big part of the problem, but working for a man who passed

Billionaire status two or three generations ago was the much bigger problem. "Nobody says no to me", he advised Myron. Right one.

Pushing my luck (I am past mid-50s and gave up clinging to slate roofs pitched at 70 degrees ten years ago), finger nails screaming for a grip that never came, somehow the peak of the multiple story roof was ascented. I felt like New Zealander Sir Edmund Hillary on Everest as I sat there pondering, "Now that I am here - how in the blue blazes will I get down without dropping 60 feet to the street

below?".

Two prior guys had been here. One installed an amplified antenna (mast head at the antenna) showing his total lack of skill levels; I measured 46 dBmV on the weakest channel coming out of the antenna with my precious FSM propped up between my legs straddling the extremely sharp slate roof peak line (you can imagine what this could do to your private parts on your own - at 55+ I did not give it a second thought). For reference, a reasonable quality MATV modulator puts out +50 dBmV so +46 is akin to connecting a 110V AC light bulb to a 220V AC line. Poof.

Yes, when several dozen analogue and DVB-T signals 'mixed' inside the 'deep fringe model' antenna preamplifier, what came out was total trash. It got better (worse!).

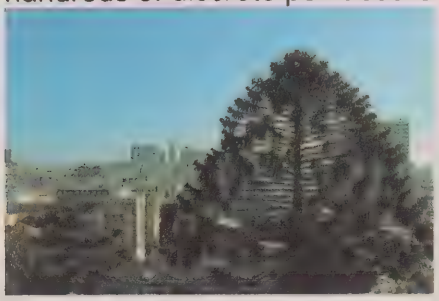
As close as Sutro was, directly between my crotch slashing roof peak and the 'TV Mountain' was a 12 story building,

surrounded by others of similar height. So the Sutro-to-crotch signals were being bounced rebounded, and skipped from vertical wall surface to reflector plate several times before they arrived in my FSM. Tugging on a rope, I raised the Avcom PSA65 spectrum analyser to my not very comfortable 'sitting' position and proceeded to look at the signals. Very educational. Not one was still horizontal, unbolting the consumer grade antenna, dismantling the amplifier and going 'direct' to the PSA65, I could easily see that by rotating the antenna through a 360 circle, not much changed. Trash in, trash out. It got worse. I tried flipping the antenna from the normal and required horizontal polarity to vertical and then at various steps between the two. As many as a dozen discrete 'point source' signals on each and every channel, and not one of them worth a damn. It was clear to me that either I was going to die and be buried (a good trick, I think) 60 feet above ground on a slate lined roof or somehow lower myself and my equipment back to a safer elevation. Nothing previously installed on the roof (at great expense, I am sure!) was going to be of any use to me.

Back in the shop, I pondered the problems (plural, there were many). The signals were strong - so strong that before we got done, attenuators not amplifiers would be required. Next, the direct path to Sutro was blocked and while I might be able to locate a suitable 12 or 20 story 'off-path' reflector to 'bounce' some of the channels into the rich man's two TV sets (imagine that - a house the size of a modern hotel and only two TV sets!), the reality was that any antenna design and any antenna heading I found that might work for 'some' channels would not work for others. Or so I thought. So how many custom design antennas could I 'stack' on this crotch splitting rooftop before I ran out of space, or crotch?

The "answer" to this dilemma was far easier said than accomplished. Because the receive site was so bloody close to the maximum power transmitters (some to 5,000,000 watts ERP!), and, the reception site is shielded by a much taller building only a few hundred feet away, the house was basically in 'RF Burn Heaven'. The 'point source' (Sutro Tower transmitters) was in fact

hundreds of discrete point sources; every building,



sign board, freeway ramp for miles around me was acting as a re-radiator of super strong signals (some of the reflected signals peaked in the area of +20 dBmV).

Fortunately, all but one DVB-T channel appears in the UHF band (470-806 MHz) so perhaps a common solution for all (but one) could be found. Normally, when you attempt to achieve a very sharp reception pattern (an antenna with a 'narrow focus' angle), the physical size of the antenna must be enlarged; a 7 foot UHF TV dish, for example, has a much more precise 'aim-it' signal pickup pattern than a simplistic dipole. Unfortunately, the client had some rules: "No part of the TV antenna shall be visible from any place on the property" came right after, "It must work perfectly on all channels". So a large antenna, which possibly would have produced far too much gain anyhow (time to use an attenuator in line!) was not doable simply because it could be / would be "seen".

Some years prior while attempting to produce satisfactory off-air ATSC DVB-T (SatFACTS #117, p. 18) in a badly shielded area where the problem was the opposite of the present situation (too little signal), I had resurrected a twenty year old Channel Master 7 foot UHF dish and carefully rebuilt just the feed portion to improve the wideband (470-806 MHz) response. The American ATSC digital system depends primarily on slotting in DVB-T transmitters onto channels which were not in use by analogue transmitters. As in Australia where 7 Network uses channel 8 for digital, this means the dial goes from half full to totally full in a geographic region as large as the San Francisco Bay area; almost literally, either an analogue or a digital transmitter on every TV channel. Limited to a single UHF antenna, and a small one at that to 'avoid visual detection', I fell back on just the feed portion of the old Channel Master 7 foot dish.

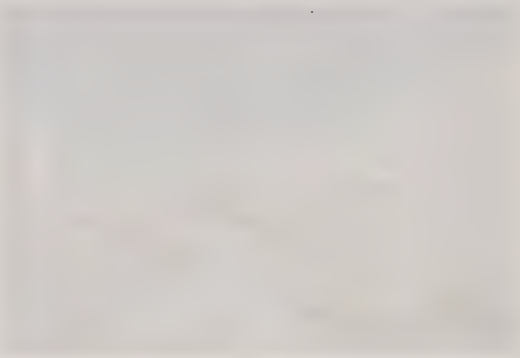
The original design used a pair of wideband ('bat wing') dipoles, fed in parallel from a common point between the two antennas. The batwings were a part of a large sandwich - in one direction the 7 foot 'sort-of parabolic' signal reflector, and on the opposite side a screen grid reflector which turns the bat wing stacked dipole into a two-element broadband pickup antenna. The reflector in this case acted to prevent direct signal pickup by the bat wing dipoles, restricting it to capturing signal that landed on the 7 foot reflector surface and then focused to the dipole array.

There would be room for the double bat wing plus the grid reflector to be mounted clandestinely partially hidden by a roof skylight, on a 3 foot stubby pole.

The long ago abandoned CM 7 footer was no longer available so cannibalising it for the feed was not an option. However, I had carefully created a clone of the original substituting larger diameter brass for the bat wing stacking lines, and more brass in place of the original CM aluminium and steel segments found in their bat wing dipoles and the reflector backplate.

The Channel Master original also provided twin loops to allow connection of a 300 ohm feed line (now - those were the days!), which I eliminated in my clone by structuring direct solder-to points for a standard CM 0089 balun (producing a 75 ohm output at the antenna stacking line connection).

What this new antenna would do is allow me to not only carefully point the 'array' for maximum signal but of greater importance, rotate the full backplate plus twin bat wing structure looking for the cleanest signals.



To the roof

The concept is that by carefully 'balancing' the physical elements of the new antenna, it would have an exceptionally clean pattern with a very high rejection of non-desired polarity signals. The best Sutro signals were found to be off path when the back plate plus bat wings were rotated 20 degrees off of horizontal. I tightened the bolts and climbed down reasonably confident that +20 dBmV on the weakest signal was going to be more than enough to do the job. Well, it did; almost. As domineering as the Sutro location is, there are other locations where TV (FM, two-way radio, cellular phones) fill the available ground space. And unfortunately CBS affiliate KPIX (channel 5 on analogue, channel 29 on digital) was not on Sutro. I had used their signal as a reference while on the roof with the spectrum analyser, aware that if they were clean for any of the adjustable receive antenna settings, the rest should also be (being closer to us and much stronger). I was around 99% correct but the last 1% would cause our client to insist "You fix that if you wish to be paid!". Right on. A digital signal that burps and "tiles" even if only say once an hour for two seconds was, in this customer's mind, unacceptable. Billionaires can be funny, that way ("if you throw enough money at a technical problem, it can be fixed" - the great American mindset!).

And there was one more piece of unfinished business. In the wonderful world that is American broadcasting, the San Francisco NBC channel had been replaced by what we in the USA call "an independent station" which means no network programming, just lots of sports, movies and syndicated programming. This caused quite a furore in San Francisco but as the city has something like 77% cable TV penetration and a companion high take-up of the Ku-band DISH and DirecTV services, NBC was "missing" not even for minutes; cable and Ku quickly found a substitute NBC channel to deliver to customers.

It happened to be in San Jose, 60 miles south of San Francisco, which meant it is at best a 'near-fringe-area' signal into 'The City' proper. Yes, the client wished it as well, but we had to remember the number two rule - "No antennas visible from the property". Now, a UHF antenna is easily nestled in the palm of your hand, and becomes invisible if held behind your back. A channel 12 VHF aerial, slightly taller than the average person when created for fringe area reception, is a much more difficult object to 'hide'. With some very precision planning, a 6 foot stub mast could replace the original 3 footer, the Blonder Tongue BTY series single channel yagi could be mounted just to clear the roof and point towards San Jose. The UHF antenna I created would nestle on the same mast. Alas, I was relearning the lesson so many DVB-T installers have also learned - signal 'level' is not the name of the game.

I admire the skills of people such as Unaohm who have created those marvellous satellite plus terrestrial meters which provide the wide variety of measurement numbers which a successful installation now depends upon. But such instruments, unlike in Australia, are very rare in the USA so I had to improvise. With each trip up onto the estate roofline my concerns about ending up in a heap on the ground were diminishing so the quick solution, under the now mounting customer pressure to "Get it right, now!", was to haul a Motorola DSR550 IRD plus a 13" TV monitor up there to the peak. This Motorola IRD has a built-in ATSC (which is the USA version of DVB-T) tuner and if you can navigate your way through as many as ten layers of menu, some very useful information appears on the screen. One is signal level in dBmV and another is "noise" which of course is the opposite of signal, but in a very clever way. With this IRD, anything that is not 'ATSC digital TV' is considered 'noise' whether it comes from analogue sources, manmade interference or instrument overload.

Finally, I had the tool required. For failing KPIX digital, I discovered that while my spectrum analyser had not 'lied' when it directed me to twist the polarity of the modified bat wing antenna 20 degrees, it was measuring more than the KPIX signal. By watching the DSR550 noise readout, I saw where by further rotating the bat wing antenna from 20 to 45 degrees, I picked up 14 dB of signal to noise ratio with only modest compromises in the already over powering Sutro site transmitters. KPIX would never 'tile' again.

For NBC digital on VHF channel 12, the Blonder Tongue yagi's sharp narrow front beam was a wonder. Just a few degrees either side of the dead-on heading for the distant transmitter and Sutro's powerful VHF signals wiped out NBC. But when carefully adjusted, the Sutro 'noise floor' went away magically allowing 20+ dBmV to sneak in on the desired signal.

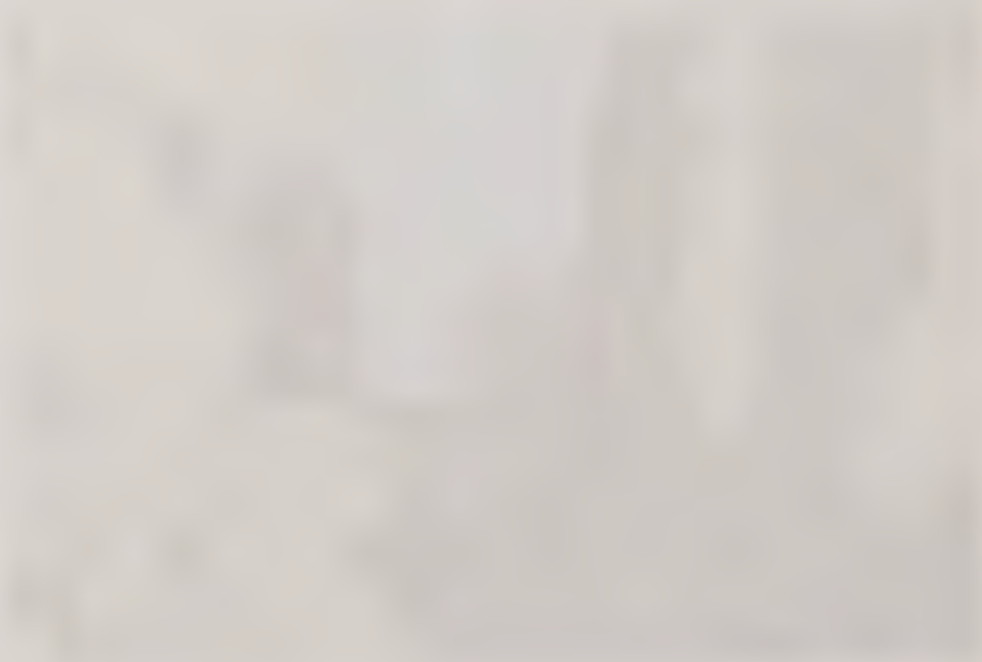
What we learned

A VHF cut to channel yagi, a carefully honed broadband UHF antenna - both precision adjusted for peak performance even if the UHF antenna 'looked' like it would be skewed - married in a VHF - UHF combiner and run through quad shielded RG6 completed the job. As prior attempts by other installers had revealed, while this is no longer an analogue world, there are still basic laws of physics which will not change.

Too much signal, especially when it seems to arrive from multiple directions simultaneously, is a major challenge when installing a receiver system nearby to the transmitter 'antenna farm'. Signal polarity, which may begin as carefully engineered horizontal, will vary greatly at even close-in receive sites. And, digital STBs or receivers are very much at a disadvantage when faced with a multiplicity of strong signals (especially when half or more are the one-day-to-be-retired analogue variety).

In this client's case I batted 98% in the end. The missing two percent? Before leaving I roamed through the grounds of the estate, peering at the roof point where I knew the antennas had been 'hidden'. I found one location, about as large as you would create by standing still and raising your arms straight out, where if you held your head 'just so' you could see one element for the larger than life VHF antenna.

Of course this 'antenna view hotspot' requires you to be at least 5'10" tall, and be standing off the manicured pathway between some prickly plantings. I doubt many people will ever notice it!



Why I won't give up my C band dish

By Tim Alderman

10-15-2005 rev d

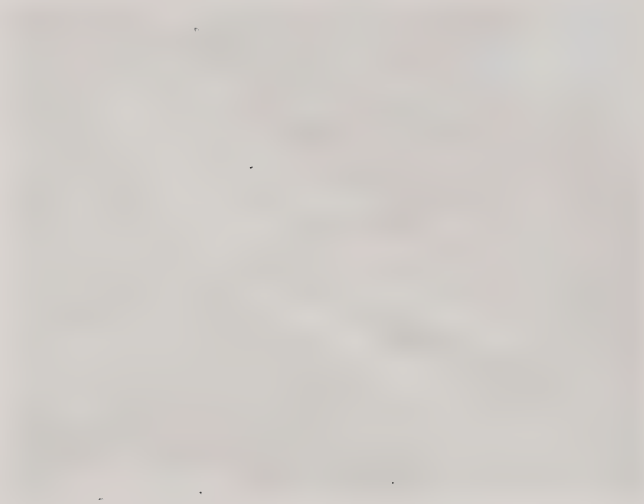
While I knew it was coming, it was still a shock. My twelve foot Paraclipse Dish, similar to the ones I built for Sat FACTS

back in 1995 and 96, has seen a decline in programming available on analog for years now. On January first of this year, Turner Classic Movies suddenly, and with only 4 hours notice, disappeared from the arc. This affected a good friend, who watched it all the time, but for me it was just another sad note of the fact that people have been tearing out their C band and going to either Directv or Dish Network, the two DBS or "little dish" providers.

I give funny names to favorite things. It wasn't just the History Channel, but the History Bistory Channel that I watched, when not on the news. Late last year the East Coast feed had gone, just suddenly, it was off the air. But I still had the West Coast feed, which gave me my fix of "Modern Marvels" and of course WWII coverage almost wall-to-wall. It was analog, pure, direct and full of the sharp inner detail that digital lacks.

I had been eyeing advertisements for some time, even on CNN, about a third DBS provider just making it's debut. It was called VOOM, and it offered to lease me 3 IRDs and install them for a dollar. The ad said, "why even your couch has a dollar". On January 31st, the remaining analog feed for History Bistory Channel was gone, poof. ARRRRGH, they hit home!

A&E Networks, owner of the channel, sent me an email suggesting I subscribe to one of the DBS providers, and named two, or get cable. They don't know that I spent 3 years of my life volunteering to build and maintain a satellite dish owner radio talk station a decade before, that was driven off the air by cable. My C band programmer, National Programming Service (NPS), said "We are



sorry, but they have discontinued service", and offered me a credit for the remaining portion of my $12.95 a year programming fee.

My heart sunk, the giant money machine corporations that control access to the public park in the sky had once again refused to deal. NPS said the service had gone to SA PowerVu. I said "hey wait a minute, I HAVE ONE". That was like pissing against the wind in a cyclone. BUT, maybe if I can find 2 friends to split the cost, and go for the VOOM package deal, I could swallow my pride and mount one of those steenking MONOPOLY DISHES on the side of my house.

The VOOM Lady, Kelly Dalton, came to visit my dealer, and part time employer, Myron. I had talked to him about the new service, and he decided to see if he could re-enter residential market sales by offering this service. Yes, yes they had HD all over the place, all about their HDTV programming, "twenty one channels of high definition bliss", but that was a side show for me. I wanted my History Bistory Channel, and here was a way, all be it rather expensive, to get it back.

Myron hired me to erect my custom feed (see SF120) and try to bring in terrestrial channels that were offered as part of the VOOM IRD package. He also talked me into trying something new, leasing equipment. The demo with Kelly had been a success. The low-to-the-horizon VOOM feed at 61.5 degrees west may have presented problems for the average DBS installer, but for me, a piece of cake. After the meeting, it was all set. I would pay 1/3rd of the $65 a month fee to get what I wanted, to see, once again, the H in the lower right hand corner of my screen, and recover the History Bistory Channel. Never mind the fact that I was supposed to keep all 3 IRD's. Kelly said that was the least of their problems, and it would be two years at least before they installed software that required the IRD to be connected to a phone line, and report where it was calling from. So, problem solved, all be it for a ridiculous price, I hid the DBS dish in the

back where nobody could see I was a traitor to my beloved C band.

March 2005 came and went. In the meantime, NPS had managed to find a way to convince A&E Networks to allow Digicipher access to their HITS[1] feed on Galaxy 4 Ku, the same feed they supply cable. As soon as I heard that, I subscribed to the "Absolute Digital Package" offered by NPS, for $199 a year. 42 channels on top of 65 from VOOM, nickels rolling out of the bag everywhere. I just had to have "diverse and redundant routing" for my view of the big H. It was a good thing I did this, as you will soon see.

I quickly discovered that, yes indeed Matilda, there ARE differences in "digital quality", even of the same signal. CNN on VOOM, C-SPAN too, had tearing from the analog signal they were downlinking at their uplink site on Long Island, New York. And the big H was not where near as sharp on the small dish. I could immediately tell it was a copy, as the signal was delayed by the all to familiar 780 millisecond delay from the satellite relay.

Yet I also watched some of the VOOM channels, and discovered TVRO programming of not-so-commercial nature on those HD channels was an interesting and eclectic mix. My friends also raved about the programming they were getting. But it was not to last.

On April fool's day, VOOM took down their web site and said, in it's place, it was no joke. They were going off the air at the end of the month. The New York Times newspaper had a couple of articles about a boardroom battle

[1] HITS – Headend in the Sky. Around since 1997 or so on G4 Ku, this was strictly cable monopoly service until NPS cracked the mold and allowed TVRO to share in the feeding frenzy.

between father and son of a cable company that owned VOOM. The very next day the furor subsided, and they were suddenly back in business. A week later came the news they were adding channels.

Strange thing was also happening at NPS. They had a new ceo, and this fellow was not about to do what had been done previously, let C band slide slowly back to what it was when I first worked in satellite, with no programming at all. NPS not only brought back my History Bistory Channel, but Turner Classic Movies, and a bunch of other programming that had died and gone to DBS and cable in recent years. So here I was, starting to feel good about the fact I had dedicated my life to C band, almost two decades before. One man CAN make a difference, and two men, in different places, had decided they wanted my business, sending them money every month.

But, it was not to last. The son gathered strength and soon ousted the father from his nest in a boardroom coup, according to the Times. VOOM had been an $800 million mistake because they entered with to little and to late. It seems that they were fighting even bigger money from Charlie Ergen (Dish Network) and Rupert Murdoch (Directv), who were intent on squashing a nascent competitor before it could achieve critical mass. Struck me like a familiar tune, a de-ja-vieu from my days at the radio station, watching as giants swung battle axes at eachother, and hearing their thunder seep under the boardroom door.

By April 30th, VOOM was all but gone. Yet their satellite was co-located with Ergen's at that 61.5 degree west orbital slot. And so Ergen had brought their satellite, already in orbit, for a paltry figure, reported to be $200 million. Paltry in giant money machine business terms. As the day approached, VOOM started to advertise "VOOM lives on, on Dish Network". It seems that Ergen had realized there was NO unique and original programming, HD or otherwise, on DBS that was not copied, like my beloved H, from C band.

So I watched to see if VOOM would send a "kill signal" to unsubscribe the ATSC portion of their IRDs in the field as they went off the air. Fortunately, they did not. These IRDs could still have a life after VOOM as free-to-air terrestrial equipment. In fact, I used one to diagnose signal-to-noise problems on the roof of that rich man's house, "Too Much Signal", published in SatFACTS.

I had also become hooked on the "VOOM HD originals". Quirky, slightly offbeat channels about exploring the world, and viewing art gallery paintings, RAVE HD "This channel should be played LOUD", and not to mention "GuyTV, TV for Guys" which showed some movies in black and white HD, which looked surprisingly good.

I wasn't interested in "Americas Top 60" or anything like that, that Ergen promoted. I had my programming from my C band dish, and I paid only a fraction of the DBS prices either one of the remaining DBS services wanted. So I called

up Echosphere, the corporate name behind Dish Network, after I read of their offering 10 of the original VOOM channels for a mere $5 a month. BUT, there was a catch, two in fact. Ergen, greedmaster that he is, had a deal, well sort of. If I agreed to pay him an "access fee" of $5 a month, AND if I were to subscribe to his HD package, at $9.99 a month, I could get my VOOM channels.

Such is temptation for programming from satellite. You get all used to the schedules, bypass the programs that repeat ad infinitum, and find just those offbeat gems of real interest, seeing things not normally associated with TV. Things I had loved with my C band dish, watching programming from Shawn Kenny's "Boresight". Programming JUST for TVRO.

Ergen even offered a promotion, "Subscribe and get HD pack for free for 6 months". Pretty good, if it worked. So I bought his "Dish Pro 811 HD" IRD. I had the subscriptions I wanted, and was back in the cat bird's seat with the best of the best. Or so I thought. Then the troubles began.

The 811 was no sweetheart IRD. In fact, it was a real dog. One of the local free-to-air channels from San Francisco, KQED, offers 5 digitals in addition to their analog. This is from PBS, which is a partially supported public broadcast service from the taxpayers in the US. No commercial station was going that far, only offering 1 or 2 digitals to go with their analog. KQED decided to do something called "dynamic channel remapping" when, at 8PM nightly, they switched OFF 3 digital channels and turned ON their HD.

My original ATSC tuner supported this. Not so, mister Ergen's 811. Not only did it refuse to remap, it went, putting it mildly, catatonic. It stopped receiving any channel, even satellite. Fortunately the troubleshooter in me managed to figure out that if I unplugged it, and then did a "master reset", it would come back. Back all naked, with my favorites, everything I programmed into that bloody box now gone.

I pounded on Myron's desk.. "Ergen sold me a piece of crap, this IRD goes beserk when KQED remaps nightly. Their customer support knows of this, and there is no fix available. I want my money back". So I packed it up, every last piece, the remote, warranty card, cables, everything. And took it to the shop.

Well into June I asked "so where's my refund"? and was told politely, Echosphere doesn't give refunds. They take your money but they do not give it back, period. If you want it, go get an attorney. In the meantime, I was paying for subscriptions I was not getting. And two weeks later, I got a call "your replacement IRD has arrived". Huh?

Turns out the only way to get anything for the $355 I had tied up in that IRD was to accept the unit and go on from there, dynamic channel remap failure or no. I had another ATSC tuner I could use, the old VOOM IRD. When I got the

"refurbished" unit home, there was a tag to send the old unit back, but no manual, remote or cables. SO I had a unit and not much beyond the front panel to change channels or setup my favorites. I hollered about no remote, and a month later, one eventually showed up. In the meantime, I had called Dish Network and they wanted $49.95 for a new remote. Instead, I opted to try eBay, where I found dozens of them for $9.95 - $29.95, some brand new, up for auction. So I bought one to have some civilized control of my IRD while waiting for Echosphere to give that replacement. Eventually I also got a manual, but this I had to pay $10 for. I never did get warranty card or cables, ohh well.

When I reactivated the subscription, having been hooked this far, I figured, what the hey, let's see how dealing with Ergen is for billing. Not to good, it turns out. Remember I said that Ergen takes money but policy prohibits ever sending any? Well, that "6 months free" for the $9.99 HD pack, was ONLY good if you called and they made an "adjustment". How many people would remember to ask for their discount in this way? DBS moneymen makes their huge dollar investment pay by making the customer pay attention. By the second month, the customer service operator said "you already have that adjustment on your bill" When I asked to speak with a supervisor "Well, that adjustment is made by another department and we have no access to them here" Grrr.. I refused to take no for an answer, and eventually the second adjustment was subtracted from my bill. I had to repeat this every single month until the offer expired.

In the meantime, Myron's rich client, whose roof I had visited with that VOOM box, wanted TIVO in his Directv box. The old HD IRD he had been getting programming on for years, from "Hughes" was suddenly available. I discretely asked if I could "borrow" it for research. I had this wild idea. If I am to lecture in Tasmania next spring at the upcoming Australasia trade show and conference, I need to be current on little dish stuff, right?

I also wanted to see just how the "cow ate the cabbage" on DBS. I knew that both Murdoch and Ergen used the same satellites. I decided to see if there was way to combine a single antenna farm on the roof of a commercial building, such as a highrise, and have Myron's client, the landlord, be able to offer his tenants EITHER SERVICE. All I had to do was figure out how to make it work, and build an antenna "farm" just for DBS.

Reasonable people would take a standard DBS dish and use that. But, I am not reasonable. I knew that any experiments would involve a lot more LOSS. Not wanting to starve my newly conceived "test bed" I bought two 1.1meter reflectors and mounted them in an inverted position, or, as Myron likes to call it, "mushroom" the dishes. This is a slight of hand I used to save his lunch on the roofs of several commercial buildings, because inverted dishes are much less of a sail in the wind. DBS dishes, ALL OF THEM, are vastly different from the C band kind. They are stamped steel with no support. Give a consumer a chance and unknowing hands warp them like potato chips. I like my Ruffles to have

Ridges but I want my satellite reflectors to be straight to the eye, within the Ku band tolerance of 20 thousandths of an inch. "De-warping" a DBS reflector is not a chore for the inexperienced, and even I have had failures in this.

The next issue was the LNBF. Ergen uses a "non-standard" mount that connects the feed to the button hook than the more universal directv kind, even though they downlink the same frequency band. That was not all Ergen did. There were several manufacturers of his "Dish Network" when he launched in 1996 or so, but by 2004, he had taken control. Not only did his big money buy programming from VOOM, but he wanted to make money from equipment sales also. Ingenious, when you control both the equipment AND the programming, you can act like a monopoly, just like cable.

Ergen's method of doing this was to create a new product called "DISH PRO". The LNBFs used by Directv use the DC power voltage to control polarity, 13V for one, 18V for the other. They have two F connectors. And therein lies the rub. In a multiple dwelling unit, you have to have BOTH polarities available. The switch that the IRD talks to, selects which to send. So unlike C band, the LNBF and the IRD have a two way communications set up. DISH PRO takes this a step further. The IRD can tell the LNBF to STACK both polarities, thus bringing the whole bird down on a single piece of RG6.

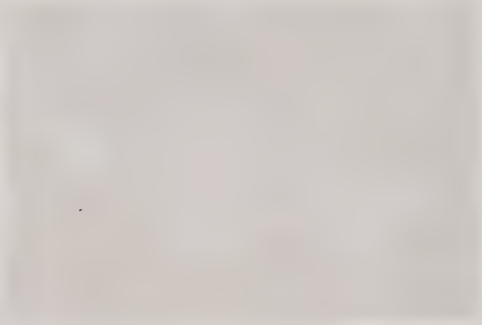
Ergen did not develop this overnight. He started out using the same technology as Directv but managed to take control away from those wanting to use common equipment. Yet he had to leave some semblance of backwards compatibility in his switches and his IRD's. So how does one connect a Dish Pro IRD to a generic or "Standard" LNBF? Simple. It turns out that Ergen had a chief designer who quit and went to Korea. This man created a company called "Microroyal" and built Dish Pro compatible switches. "Under the hood" it turns out Ergen had used a standard called DiSEqC that changes satellites. Microroyal offered these, via sellers on eBay, for a pittance compared to the hundreds of dollars Ergen wants for his brand named units.

So the DiSEqC switch gets commands from the IRD as to which satellite and polarity, which in turn controls the LNBF. Dishes have become so cheap that a standard evolved to use multiple dishes to change satellites rather than the traditional way used in C band, the actuator or jack to move the dish.

Ergen countered his former employee turned competitor with a real smart move of his own. He called it "DISH PRO PLUS". In this method, Dish Pro switches only talk to Dish Pro LNBF's, they simply do not recognize anything else. And Dish Pro Plus combines a multi-satellite "twin" LNBF with an INPUT

that accepts signal from a third satellite. Put a Dish Pro Plus out at the end of the line, and even his Dish Pro switch gets bypassed. The IRD just doesn't see it and talks through it, to the LNBF instead. Ergen had always been a "multi-satellite" provider, knowing that you can only pack so many channels at a single orbital slot.

With seven million customers, Dish Network is catching up on Directv, with eleven million. Murdoch's Directv became sort of a giant, lumbering along slowly. They were slow to adopt a multi-satellite yet single dish, or what we used to call, a "simulsat" dish. Realizing they had competation, of a sort, Directv launched a catchup scheme by choosing 3 satellites, each nine degrees apart. In their setup, they call it an "oval" because of the reflector's shape. First they had "SAT A" which was the bird they used at 101 degrees west orbital slot. You MUST have SAT A connected to a Directv box for it to recognize anything. Then they leased capacity on Ergen's bird at 119 degree west orbital slot, needing more and more transponder space to carry all the "local into local" channels they wanted in every major marketplace in the US. And then they conceived of a way to further differentiate themselves by using a special LO for the third, or 110 degree orbit. So both companies made things difficult for some enterprising local business owner to combine the two on the rooftop. That third position Directv called "SAT C" and made installers buy a special switch to get HD programming.



By the time I realized all of this, I had a several hundred dollar investment made, and 6 DBS dishes. I also decided to try Dish Network's version of Local-into-Local by getting what they call "local channels" for $5.99 a month. Once I had this, I decided to get another Dish Pro LNBF by having a dish network installer come and install a dish just for the locals, from an orbital slot of 148 degrees west. (It's the dish on the far left in the photo above) It shocked me to find out Ergen installed this for free, all I had to do was sign a form. Yet he refused to put in anything but a standard dish, a twin, with the single feed.

So Ergen basically achieved his goal of separating his hardware from that of Murdoch's Directv. Only one polarity, the 18v from the 119 degree west satellite, works on both. And Ergen has to be able to control that with it's DC voltage, or the Microroyal switch won't recognize it. Thus it took six dish reflectors to receive signals for both Directv HD and dish network HD IRD's. Thank goodness for Myron's client, loaning me that IRD! To pay $44.95 a month which is what Directv wants for ANY service, would send me to the poorhouse real soon.

I did manage to pull a coup, well sort of, on Ergen. Remember that 61.5 orbital slot, the one beside my house? To get a Dish Pro LNBF to physically fit on a standard button hook, I found a "satellite salvage" seller on eBay. They had found that Echosphere takes their used equipment, in this case LNBF's, from the field and removes the outer plastic shell. This exposes the waveguide and ruins it for resale. But for me, humm, I need an LNBF throat to grab with the standard buttonhook feed support tube. I merely taped it with electrical tape and Scotchcoated the entire thing to weatherproof it. The distance between that dish and the remaining 5 is a distance of almost 200 feet.

So I had to use RG11 cable to reduce the loss. Even though I had signals strength about 4 to 6dB hotter than standard, this was still not enough to have the DiSEqC Microroyal switch talk to it reliably. And once that was sorted out, the 811 Dish Pro IRD would see the LNBF, but not talk. So I had to add RG11 back from the switch to my room.

So, now, finally, peace of mind in signal gluttony land. With 4 operating satellite systems,

I can watch my History Bistory Channel on C band, and fallback protect it with Directv. And be able to say something to the attendees at next year's trade show about US DBS satellites.

So, if you plan to attend, you will be able to hear speakers who know what in heck is going on in TVRO today. And who still love their analog C band reception systems. At least one.